COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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15/year — March 28, 1977 — Vol XI, No. 13

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NEWSPAPER

Canned Kudos

ICP Salutes Packages With $1 Million Sales

By Don Leavitt
Of the CW Staff

CHICAGO — Two hundred and twenty-seven software packages have each accounted for more than $1 million in sales. More than half that group has had sales of $2 million or more, according to Larry Welke, president of International Computer Programs, Inc. (ICP).

Three of the packages have exceeded $20 million, one has gone over the $30 million mark, and one — Total, the data base management system from Cincom Systems, Inc. — has topped $50 million, he said in welcoming vendors to the sixth annual Million Dollar Awards ceremony held here last week.

"We have an industry, ladies and gentlemen. It is successful, thriving and prosperous. You are to be congratulated on a job well done," he told the dinner meeting, hosted by ICP at the Chicago O'Hare Hilton.

The idea behind ICP's Million Dollar Awards was born only six years ago, he said, "when some Philistine claimed that the software product industry was a figment of our imagination, that not a single product had ever registered more than a million dollars in sales."

That was not long after IBM unbundled its software, but "we counted and found 29 products that year that had already passed the million dollar mark," Welke said.

The list's growth since then has occurred largely because users recognize the logic of acquiring software that is already developed, rather than trying to build everything themselves, he said.

(Continued on Page 2)

Finds '74 Law Ambiguous

Commission to Urge New Privacy Act

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. — The Privacy Protection Study Commission has declared the Privacy Act of 1974 "a good start," but a law that needs "considerable improvement."

Accordingly, when the commission recommends privacy standards for private-sector personal record systems to the President and Congress in June, a proposed "Privacy Act of 1977" for the federal sector will be included, the commissioners agreed at a recent meeting here.

The commission's proposed revisions are based on its assessment of the Privacy Act of 1974 and seek to clarify ambiguous language in that two and a half year old law. Besides providing the private sector and states with a model privacy law, the changes would make implementation of privacy in federal recordkeeping practices more flexible by incorporating "reasonableness tests."

At the same time, the commission would amend the act to take account of technologies most being used by federal agencies and likely to be employed by them in the future.

The Privacy Act of 1977 would also establish a Privacy Act office and officer in every agency and give that person and his staff the authority and responsibility to implement the act, make policy regarding it and hear complaints from individuals.

Come June, the commission may urge Congress to establish a board or some other organization to oversee at least federal implementation of privacy standards, according to Carole W. Parsons, the commission's executive director.

The revised Privacy Act would include new definitions for "record" and "systems of records," Parsons said. "Records" in the present law would be extended to include all records identifiable by an individual's attributes and personal characteristics.

The notion of a "system of records" would be abandoned for the concept of "reasonably accessible records," Parsons stated.

An individual's record created for one reason may continue to find "routine use" for another purpose if these purposes are compatible. Under the revised act, however, the individual would be told the set of purposes for which a record was being created, she added.

"Routine use" rules would apply to internal as well as external uses and disclosures of personal information, Parsons said.

The revised Privacy Act also would drop the 30-day advance public notice when records are created because the commission has found this portion of the present law doesn't really help anyone outside the gov-

(Continued on Page 6)

IBM Rebuked for 'Harassment,' Denied Additional Itel Papers

By Catherine Arnst
Of the CW Staff

NEW YORK — Judge David N. Edelstein has upheld Itel Corp.'s charges that IBM attorneys harassed and intimidated it to obtain documents for the U.S. vs. IBM antitrust trial here [CW, Feb. 21].

Edelstein denied a motion by IBM requesting further production of internal Itel documents "in light of the conduct of counsel for IBM."

Statements made by IBM attorneys to Itel personnel were "improper, ill-advised and had the clear tendency to harass and intimidate regardless of the intent of the speaker," the judge said in a March 17 memorandum.

"Counsel have an obligation scrupulously to avoid both conduct intentionally intimidating and conduct which tends to have that effect. That obligation was not kept in [this] case," Edelstein wrote.

Edelstein has rarely denied IBM motions for discovery in the past, although many companies have requested relief. Their requests were generally made on grounds of attorney-client privilege and the unreasonable burden such production would place on the company.

Pretrial Order No. 13 is adequate protection for the privacy of any privileged documents, Edelstein has usually stated in the past.

Itel's request for relief was also based primarily on the privileged nature of the documents and unreasonable burden of production. Its assertion of harassment was not an explicit basis for its claim.

However, Itel "raised a serious question about the good faith of IBM's discovery demands from Itel and the propriety of certain conduct by counsel for IBM," Edel-

(Continued on Page 2)

Caravan Starts Tour This Week

By Frank Vaughan
Of the CW Staff

SAN FRANCISCO — Executives from several computer manufacturers plus an official of the Federal Communications Commission (FCC) will present industry keynote speeches during the Computer Caravan's sixth annual tour, which begins here this week.

Each day of the three-day program has its own theme; the standard format includes a keynote speech followed by consultants' tutorials and workshops conducted by regional users, according to Edward J. Bride, director of the forum program for the Caravan.

The second day in each of the nine cities will feature industry speakers on the theme of "Managing Terminal Networks," Bride noted. Ben I. Holmes of Hewlett-Packard Co. will keynote this program in San Francisco.

The only exception to the industry orientation will be on June 1 in Washington, D.C., when Walter R. Hinchman, chief of the FCC's Common Carrier Bureau, will present the keynote on managing terminal networks.

Representatives of two leading DP

(Continued on Page 6)

Citibank's Distributed DP: Duplication Means Progress

By Ronald A. Frank
Of the CW Staff

NEW YORK — When users of distributed processing are mentioned, Citibank in New York is invariably cited as a prime example.

But Citibank did not begin with the idea that large central computers should be displaced with smaller, decentralized processors. Instead, the bank was looking for ways to shift the ever-increasing costs of labor into capital costs, according to Jon Gould, vice-president.

In the process of reducing the labor costs, it became necessary to find ways in which manual operations could be performed by a machine. This move toward automating manual operations led the bank into selecting minicomputer-based systems.

Today Citibank has hundreds of small processors performing tasks that previously required interaction with a central DP site or were done manually. In many cases, similar applications are being developed in different groups on different machines.

In some businesses, this would be regarded as an unnecessary duplication of

CW Special Report on Distributed Processing follows Page 44.

effort, but not at Citibank. "We're riding a technology curve," Gould said, adding that as long as the cost of automated transactions is less than the cost of having the same applications done by labor-intensive manual methods, the duplication of effort is not important.

As each department attacks an application, the DP approach often gets further optimized, often taking advantage of newer technology, he noted.

Citibank does have a central group that advises individual managers who are developing applications on their own machines. This group encourages departments working on similar problems to share experiences, but such interaction is not mandatory and often is overlooked.

The key to the Citibank DP approach is that each manager decides how he will implement his goal within his budget. "He decides how best to set up his shop," Gould said.

To help managers in the selection of their DP equipment, Citibank maintains a "Technology Caravan," a continuing display of new minis, micros, peripherals and other equipment that is brought in-house for demonstrations and evaluations.

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Second-class postage paid at Boston, Mass., and additional mailing offices. Published weekly (except a single combined issue for the last week in December and the first week in January) by Computerworld, Inc., 797 Washington St., Newton, Mass. 02160.

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50 cents a copy. $15 a year in the U.S.; $23 a year for Canada and PUAS; all other foreign, $40 a year. Four weeks notice required for change of address. Please allow six weeks for new subscription service to begin.

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Computerworld can be purchased on 35 mm microfilm in half-volumes (six-month periods) through University Microfilm, Periodical Entry Dept., 300 Zeeb Rd., Ann Arbor, Mich. 48106. Phone (313) 761-4700.

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Can Now Go to Trial

Five Suits Against IBM Get Green Light

By Molly Upton
Of the CW Staff

SAN FRANCISCO — Judge Ray McNichols last week gave the green light to five firms that have been waiting to move their antitrust suits against IBM off paper and into a courtroom.

The five trials had been delayed by an IBM motion asking those suits not be tried until an appeals court decides whether McNichols acted correctly last February by dismissing California Computer Products, Inc.'s antitrust case against IBM for lack of evidence [CW, Feb. 21].

Although McNichols denied IBM's motion for a stay, he indicated he would consider approving it if he could obtain some real assurance that the Calcomp appeal would be decided within a year by the Ninth Circuit Court of Appeals, sources said.

The Ninth Circuit still has not ruled on an appeal filed by Greyhound Computer Corp. in 1972 after its antitrust case against IBM was dismissed.

The five firms who can now proceed with their antitrust cases are Memorex Corp., Transamerica Corp., Hudson General Corp., DPF, Inc. and Forro Precision, Inc. Hudson General was the only firm that wanted to wait for the outcome of the Calcomp appeal.

These five cases, as well as Calcomp's, were consolidated in the pretrial phase under McNichols' supervision.

In striking down IBM's motion for a stay, McNichols also set time limits on the discovery process for Memorex and Transamerica. After the discovery process is completed, they can search for a judge to hear their cases.

Memorex's case is expected to come to trial later this year.

Before issuing his ruling, McNichols heard arguments from the parties' attorneys in his chambers. The judge seemed concerned that a stay in the proceedings would have an adverse financial impact on the plaintiffs, the sources said.

227 Packages Reach $1 Million

(Continued from Page 1)

While sales dollars are one indicator of the industry's success, they don't tell the whole story for some software products, Welke added. For that reason, this year's ceremony also acknowledged packages in terms of the number of installations their sales represented.

Because "there is a marked difference in the universality of applications software as opposed to what is generally termed system software," Welke tallied the groups separately.

There were 27 "systems" packages for which vendors reported more than 500 installations compared with only six "applications" packages that reached that plateau, he noted.

On the systems side of the ledger, The Librarian from Applied Data Research, Inc. was on top with 3,300 installations, the Westinghouse Disk Utility package ran second with 3,152 sites and Panvalet from Pansophic Systems, Inc. accounted for 3,000 users, Welke said.

With 1,300 installations, the Alltax tax calculation package from Management Science America, Inc. headed the applications list, followed by the Statistical Package for the Social Sciences from SPSS, Inc. with 1,100 sites and the Job Accounting/Reporting Systems from Johnson Systems, Inc. with 1,050 users.

The regular Million Dollar Awards are based on cumulative sales since the products were first introduced. Starting last year, however, Welke recognized that sales volume in a single year is another indicator of a product's acceptability or of the vendor's sales efforts; this year's "Million-in-One" awards went to seven products whose sales topped $1 million in 1976.

New Members Welcomed

The efforts of individual salespeople are also recognized in the ceremony. At last week's dinner, 51 new members were welcomed into the ICP Society of Super Software Sellers, which now includes 95 people who have sold more than $1 million worth of their products.

But even salespeople need help, and advertising agencies — especially those that understand the software business — make a notable contribution to the marketing effort, he continued. Seven agencies received special commendations for work they did for software clients in 1976.

Judge Rebukes IBM for Conduct

(Continued from Page 1)

stein said. "The fact that Itel does not rely on these assertions does not dissuade the court from considering them in its evaluation of IBM's motion."

The conduct to which Edelstein referred, according to charges by Itel attorney Norman Roy Gutman, was statements made by IBM attorney Max Shulman to influence Gary Friedman, vice-chairman of the board and cofounder of Itel, who was an upcoming government witness.

The IBM attorney told Gutman that if Friedman did not testify adversely to IBM's interests, no further production of documents would be requested, Gutman said.

In a fiery oral argument before Edelstein last month, Gutman said he did not mean to impugn the character of Shulman; any criticism should not be directed to the attorney but to "the faceless mandarins who are his masters and with whom he consulted during the course of the conversations."

The remarks were meant only in jest and not as a serious proposal, IBM attorney Paul Dodyk told Edelstein in that same argument.

IBM was requesting all of Itel's internal corporate documents since Dec. 31, 1974 that related to new developments. Itel had already produced enough documents predating that time to cover "five city blocks," Gutman said, and production of the documents IBM was requesting would be placing "the vitals of Itel in the hands of our greatest competitor."

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Will SM1-5740, SM1-5734 and old SMO23 ever recover fully from all those heel spurs, shin splints and sore elbows?

Frankly, the prognosis is not good. *Because as of March 1, our SyncSort ill-and-a-half became the most popular sort in North America!*

Here are the standings, as relayed to us by our scout in the Grapefruit League:

ANALYSIS OF SORTING MARKET*
OS & OS/VS
(U.S. and CANADA)

Rank	Sort	OS Users	OS/VS Users	Total Users	% of Market
1	SyncSort	455	742	1197	36.8
2	IBM SM1-5734	958	129	1087	33.4
3	IBM SM1-5740	NA	603	603	18.5
4	IBM SMO23	263	NA	263	8.1
5	Other	75	30	105	3.2
	Totals:	1751	1504	3255	100.0

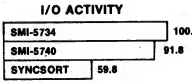
(In addition, SyncSort has over 300 users overseas)

Are we proud that we're No. 1? Sure. Who else do you know who's taken 36.8% of *any* market away from the Computer Giant? (You can count the names on the finger of one finger!)

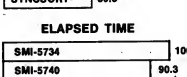
The main reason for SyncSort's primacy is simply performance. It does more sorting work at less cost in machine resources.

Matched against the "tottering threesome" it will give you savings on the following order:

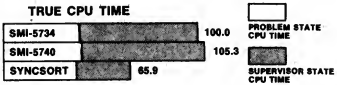
I/O ACTIVITY



ELAPSED TIME



TRUE CPU TIME



Of course, there is one danger to being No. 1. Those nifty little sorting techniques, on which you expended so much blood, sweat, toil and tears, have a way of showing up regularly in your competitor's sorts.

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We don't know. But we will make one prediction. When he gets out there on the field in major-league sorting, with its flashing spikes, beanballs and salty language, he'll receive quite an education!

*Supporting data on request.

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Link for CDC Systems Offered

BROOKLYN CENTER, Minn. — A commercially available interface system consisting of two adapters allows Control Data Corp. mainframe users to attach plug-compatible manufacturers' (PCM) peripherals, according to Network Systems Corp. (NSC).

The capability is part of the firm's plans to provide multidrop networks connecting various makes of CPUs and peripherals, according to Mahlon Moore, vice-president of marketing.

NSC's A510 emulates an IBM block multiplexer channel and permits the attachment of an IBM-type controller. It is linked via coaxial cable to an A110 processor adapter.

The A510 obtains the entire channel program from the adapter's control memory instead of directly out of main memory, Moore explained.

"What we're doing is moving that channel program out to a remote channel and allowing it then to be multiplexed between two processors, which can be of any manufacture," he said.

Interest Expressed

Although the firm currently has only one CDC installation using PCM peripherals, Moore said users have expressed considerable interest in being able to link up IBM-type peripherals because of the advantages in both performance and pricing.

NSC's interface system can transfer data at 50M bit/sec over a 1,000-ft cable and can sustain that rate at longer distances using higher grade cable, he said.

The firm is currently developing processor interfaces for the Digital Equipment Corp. PDP-11, Data General Corp.'s Eclipse and the IBM CPUs.

In the future, it plans to develop similar devices for the Cray processor, Systems Engineering Laboratories SEL 32, Modular Computer Systems, Inc. CPUs, the Univac 1100 and the Digital Equipment Corp. Decsystem-10.

The multidrop approach envisioned by the firm will allow users to functionalize tasks and assign them to specific CPUs while also downloading tasks from one machine to another, Moore said.

Prices for a system consisting of two adapters range from $50,000 to $76,000.

NSC was founded in 1974 by Jim Thornton, who helped design the CDC 6000 series and the Star.

Although mainframe manufacturers speak disparagingly of a proposed standard interface that would permit the attachment of plug-compatible manufacturers' (PCM) peripherals to their mainframes, users who have either bought or built their own interfaces are pleased with the results.

Mainframers opposed to the proposed input/output channel interface standard, which is based on IBM's interface, cite disadvantages such as performance degradation, hindrance of advances in technology and technical difficulties [CW, March 14].

The proposed standard is being considered by the American National Standards Institute's X3 committee as well as by the federal government.

Computerworld *associate editor Molly Upton interviewed some users and vendors of "black boxes" that allow attachment of PCM gear to non-IBM mainframes, including firms that cater to the Digital Equipment Corp. Decsystem-10 and PDP-11 series and Varian Data Machines and Control Data Corp. mainframes.*

She also found a user that had the resources to design and build its own CDC-IBM channel adapter.

'Box' Backs Decsystem-10

With the help of the SA-10 from Systems Concepts, Inc. of San Francisco, two Digital Equipment Corp. users have attached peripherals originally designed for IBM systems by plug-compatible manufacturers (PCM) to their Decsystem-10 CPUs.

One of these users — First Data Corp., a time-sharing firm in Waltham, Mass. — has been using SA-10s for two or three years to hitch California Computer Products, Inc. disk drives to its Decsystem-10.

The PCM drives are more cost-effective and reliable, according to Jim Burley, First Data vice-president, who estimated his firm saved 25% to 50% of the cost of comparable DEC equipment by going to a PCM.

Currently First Data has 200M-byte Calcomp drives hung on the SA-10, which acts as a channel directly into the Decsystem-10 memory.

No Degradation

There is no real degradation since the device operates on block transfer and is a high-speed unit, Burley said.

First Data had the option of also hooking IBM 1403 printers to the SA-10, but instead installed a Grumman Data Systems Corp. printer controller.

Quite a bit of software is needed to accompany the SA-10 and to allow the monitor to interface with the peripherals, Burley said. The software requirement is partially why — instead of hanging Storage Technology Corp. (STC) 6,250 bit/in. tape drives on the SA-10 — First Data bought a device from DEC that permits the drives' attachment to the Decsystem-10s.

First Data then procured the STC drives directly from STC rather than through DEC, which purchases them on an OEM basis from STC.

"DEC's clever on the new monitor for the KL [processor], which doesn't support non-standard drives, so we had to buy a DEC controller and drive to be able to load the monitor without going through special work," he observed.

The firm buys from DEC what it needs in the way of one controller and one drive per system to load the monitor and then generally procures non-DEC disk drives, he said.

Software Development

But, Burley remarked, the user who takes this approach is on his own on software development, and "when DEC changes the monitor one has to adapt to these changes. Nevertheless, it's still worth it to get the improved performance, throughput and price performance," he said.

The SA-10s, which range in price from $30,000 to $37,000, have proved extremely reliable, he said, and almost never fail.

Another SA-10 site, Dataline Systems Ltd. in Toronto, incurred less software development. The firm plans to phase out all its DEC tape drives when it gets its fourth SA-10, according to Don Kennedy, vice-president of technical services.

The service firm has four Decsystem-10 processors of the KI or 1060 variety.

Three SA-10s allow Dataline to use STC Model 3450 tape drives as, well as single-density 3330-type drives from Itel Corp. and 1403-1-type line printers from CDC, he said.

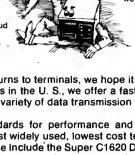
All of the tape drives can be switched among the various processors with the SA-10 boxes, he said. Each SA-10 goes to an individual controller and then the tapes are shared by the controller.

By year-end, when the firm gets its third set of STC drives, it will have four controllers and 16 drives.

Dataline has not had to develop much software to implement the SA-10s because it acquired software for the tape drives from the University of Pittsburgh and is getting software for the disks from Systems Concepts. It did write its own software for the printer, Kennedy said.

Dataline got its first SA-10 about three and a half years ago and Kennedy, who's been in the hardware arena for 12 years, said he has seen nothing that can match the SA-10's reliability.

TERMINAL HAPPINESS



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User Designs, Builds Own Adapter Channel

BERKELEY, Calif. — The inherent savings and reliability of IBM plug-compatible peripherals used with Control Data Corp. mainframes more than compensate for any loss in performance, according to Robert Fink, manager of hardware development at the Lawrence Berkeley Laboratories' computer center here.

From experience with an IBM-CDC channel adapter that the research lab developed and built for its own use, Fink countered many of the mainframers' arguments against the proposed I/O channel interface standard that would allow attachment of plug-compatible manufacturers' (PCM) gear to non-IBM CPUs [CW, March 14].

The Lawrence Berkeley Laboratories has been able to attach Storage Technology Corp. (STC) 6,250 bit/in. tape drives to its CDC 6600 with help from its own channel adapter.

Designer Art Turney is completing alterations that will allow attachment to a CDC 7600 as well, Fink said.

The channel interface took about a year to design and put on the floor as a prototype. The project required a year of work by one design engineer and a number of technicians and about six man-months of programming to initially handle the 6,250 bit/in. drives, Fink said.

With a total of about 12 to 18 months of programming, the lab will have rewritten all tape-handling software for the CDC 6600, he added.

The system, which has been working since December, enables the lab to exchange media with other laboratories also performing work for the Energy Resources and Development Agency (Erda). Some of the other labs have IBM mainframes.

Standard Not Difficult

The proposed I/O channel interface standard is not difficult to implement; the specifications are clear enough, Fink said. Furthermore, it doesn't destroy the mainframe's architecture and it allows a user to use equipment in the competitive PCM marketplace.

Fink emphasized that any degradation of storage capacity or performance is caused not by the intervention of a "black box," but by the design characteristics of the IBM channel compared with those of CDC.

The IBM design includes a number of features to provide for upward compatibility, such as some overhead for select sequences on tape drives, he explained. With a speed of 50- to 100 microsec for select sequences on the tape controller, the drive has a tendency to stop on the interrecord gap, thus causing a loss in throughput, he said.

Because of the difference in formatting on disks, there can be as much as 25% less storage space using the IBM scheme than the CDC method with certain size records, Fink said.

And transfer speeds with CDC native mode can be faster, he added. For instance, in the CDC native mode, an IBM 3330-type drive can be almost as fast as IBM's 3350, he said.

While these factors do lend credence to the argument that degradation can occur using the IBM channel, the economics of the situation more than compensate, he said.

PCM disk equipment costs about 50% to 60% less than comparable CDC gear, he indicated.

Although Fink is an advocate of the proposed standard interface that allows the use of IBM-type peripherals on other large CPUs, he did say the same principles and savings don't always apply to smaller machines. Those advocating the interface standard for machines costing under $1 million should examine the trade-offs, he cautioned.

"Many of the smaller machines can be more economically dealt with not on the PCM level, but on other levels," he said.

For example, there are a number of disk drive manufacturers whose products attach to what is becoming a de facto standard, the CDC storage module interface, he said. Disk controllers are tending to use this interface, thus offering users of various small systems a wide range of disk drive choices, he said. Prices are as low as $10,700 for a 300M-byte drive, he pointed out.

The laboratories' CDC-IBM channel adapter creates either a selector or block multiplexer environment on the channel. This capability was facilitated by the peripheral processor units (PPU) that perform I/O functions on CDC machines.

A PPU is a channel computer and handles the "nasties that make a block multiplexer more complicated than a selector channel," Fink explained.

However, the box contains a significant amount of logic and some innovative techniques, he added. The adapter contains about 300 medium-scale integration chips and uses several micro sequencer logic techniques, he said.

The use by CDC CPUs of a 60-bit word does not present a problem, Fink said. The box can handle either packed or unpacked data; the PPUs accept 12-bit characters.

To ensure compatibility with what might appear in the future from IBM, the Lawrence Berkeley unit was also designed to handle a 16-bit-wide bus, double the width of the current bus. This would help maximize throughput, he said.

IBM channel design specifications provide an unused data cable that could serve to double the bus width, he added.

Such a system depends on software consistency by the mainframer and requires expertise in systems development at the operating system level, he said.

Without in-house expertise, a user could not expect to either get or keep the machine working through systems evolution.

Information on the adapter is in the public domain because both the University of California and Erda have waived patent rights, Fink noted.

Varian Users Aided

SCOTTSDALE, Ariz. — Varian Data Machines users and Digital Equipment Corp. PDP-11 series users can select gear designed for IBM users by plug-compatible manufacturers (PCM) through the use of an IBM channel simulator from Datawest Corp., a vendor spokesman said.

Datawest is also developing an interface for the Interdata 7/32, he added.

Supplied With Diagnostics

The device is supplied with preliminary diagnostics and users write their own software, he noted. The price is about $40,000 for the device, which consists of one box that appears to the CPU as its own brand of peripheral controller while the peripherals view it as an IBM controller.

The interface was originally developed as a testing tool for IBM systems, but the firm has installations where it is used to hook up PCM equipment to the Varian and DEC machines, he said.

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Commission to Recommend New Privacy Law in June

(Continued from Page 1)

ernment, Parsons noted.

In addition, the 30-day stricture generates a paperwork burden for the federal agencies, she said.

The Privacy Commission wants to separate and clarify the jurisdictions of the Privacy Act and the Freedom of Information Act (FOIA), Parsons said, making the Privacy Act "the sole vehicle for an individual seeking access to his own information."

At present, the Privacy Act and the FOIA overlap in some areas. The Privacy Act would be rewritten to use the same exemptions as the FOIA in the areas of national security, foreign policy and law enforcement, she said.

The revised Privacy Act would retain exemptions for civil proceedings, investigatory material, testing or examination material and evaluation material for promotion in the armed services, she noted.

If an individual can obtain more information under the FOIA, however, that act and not the privacy law would be used, Parsons said.

Derivative Systems

Individuals also will have the right to access records kept in substantially similar or derivative versions of a system created for some other purpose, she stated.

Agencies will be required to correct errors in these derivative systems as well as in the original system if Congress accepts the statute proposed by the Privacy Commission. Errors uncovered by the agencies themselves, as well as those found by an individual, would be sent to sources and prior recipients of the information, Parsons said.

The proposed privacy statute would further restrict information uses and disclosures within a large agency like the Department of Health, Education and Welfare, she stated.

Disclosures to individual senators and members of the House of Representatives would be allowed in cases where a constituent has permitted access to information about him.

The agencies consider accounting for disclosures the most burdensome aspect of the present Privacy Act, according to Parsons and the Privacy Commission staff. The agencies argue they receive almost no requests from individuals for an account of what has been disclosed about them.

Moving into a new area, the proposed privacy statute would prevent law enforcement agencies from maintaining unverified information on individuals, Parsons said.

As for security, agencies tend to have an excess or a total lack of security under the present Privacy Act. The rewritten law would substitute a "reasonableness test" for the "appropriate" and "any anticipated threats or hazards" test now specified.

It would also introduce the concept of a "risk management" or minimized risk, Parsons stated.

The public notice provision of the present law, which requires announcement of systems or subsystems used by an agency with some indication of how records are grouped, has failed to serve the average citizen who wants access to a record about himself, she said.

Therefore, the commission suggested the revised statute make the notice serve bodies or individuals charged with overseeing implementation of the Privacy Act. All notices of a system would have to include a statement indicating under what authority the records are being kept, she said.

'Fairness' Clause

The revised statute would add a "fairness in determinations" clause requiring an agency to take "reasonable affirmative steps" to reconsider a judgment it previously made about an individual on the basis of erroneous or disputed information, Parsons said.

The revised act would also extend privacy strictures to recordkeepers who are the recipients of discretionary federal grants — primarily those in the research area, she added.

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Caravan Set to Start U.S. Tour This Week

(Continued from Page 1)

publications, *Computerworld* and *Datamation*, will give keynote addresses on the first and third days, respectively, in Los Angeles. *Computerworld* associate editor Esther Surden will open the Los Angeles Caravan April 5 with the theme "Applying Minicomputers," and John Kirkley, editor of *Datamation*, will open the third day's program on the topic of "Improving Software Productivity."

Other Speakers

Other speakers and locations include:

- Los Angeles, April 6: William B. Patton, vice-president of western operations for Honeywell Information Systems.
- Cleveland, April 20: G.P. Williamson, vice-president of NCR Corp.
- St. Paul, Minn., April 27: Robert Price, president of Control Data Corp. Systems Services and Marketing.
- Chicago, May 4: Fred Meier, vice-president, of product management, Burroughs Corp.
- New York, May 11: Roger Moody, marketing manager for AT&T.
- Philadelphia, May 25: Neil Gorchow, vice-president for product strategy and requirements at Univac.
- Boston, June 8: Deke Hensley, vice-president for technology, Satellite Business Systems.

The other two keynoters in San Francisco will be Henry Nanjo, director of the City of San Francisco's Data Center, on March 29 and Ken Kolence, president of the Institute for Software Engineering, keynoting the program on software productivity.

86 Exhibiting Firms

Sales and technical representatives of 86 computer and computer-related companies will be on the floor to give visitors product and service information.

Exhibits will cover 34 areas of the industry including data communications equipment; minicomputers; miniperipherals; data acquisition and control equipment; output equipment; software; small business computers; data security products and services; intelligent terminals; CRT terminals; independent memories and peripherals; data entry equipment; DP supplies; and general-purpose computers.

The program, which is sponsored by Computerworld, Inc., features a three-day Computer User's Forum in all nine cities plus a technical Computer Designer's Forum in San Francisco, Los Angeles, Chicago, New York and Boston.

Duplication Means Progress at Citibank

(Continued from Page 1)

In some cases, a department manager may decide to scrap one processor for another. The discarded machine is put into an equipment pool where other managers can utilize it if it fits their needs.

Although each manager develops applications as a self-contained DP operation, he is still subject to banking and management controls. The result has been a classic example of distributed processing, although the original goal was simply to cut costs and make banking operations more efficient, Gould said.

Many of the bank applications now automated had been done manually in 1970, when the Citibank program began.

The Citibank philosophy has encouraged more innovation in managers and many departments have developed novel approaches to solving classic banking problems, Gould said. There are no set DP regulations on how a department must develop an application, and many use outside software consultants to speed their development time.

The only restriction is that the application must be developed within the budget allocated to it. And from a management standpoint, as the technology has increased, the budgets are continuing to be tightened, Gould said.

$80 Million Savings

Within this overall framework of continuing to automate applications previously performed manually, Citibank has saved an estimated $80 million since 1970. Gould was quick to point out, however, that this figure has sometimes been misrepresented and should be put into perspective.

Using the growth rate in operating expenses during the 1960s, 1975 costs would have been $400 million instead of the actual $240 million. The difference of $160 million would have meant a net savings after taxes of about $80 million, he explained.

The strategy at Citibank is to take advantage of the continuing decrease in DP costs which has been most dramatic in the mini and now the microprocessor areas. The goal as each application was automated was to increase the quality of the operation while keeping costs flat or reducing them.

Eventually, an application can reach a point where it is volume-insensitive, Gould said.

In effect, an increasing labor cost of 14% to 18% per year has been replaced with automated applications that are benefiting from the decreasing costs of technology, he added.

The greater dependence on technology instead of manual operations has cut the bank's staff from 10,500 in 1970 to about 5,000 now. But employees have not actually been thrown out of work by machines.

Smaller Workforce

In almost all cases, the workforce was cut through normal attrition, and many operators were retrained to operate DP terminals instead of doing manual work.

If technology costs begin to level off, the savings at Citicorp could be less dramatic. But Gould does not see that happening for some time.

"Our applications are still behind the state of the art. Most of our managers are working with minicomputers while the real savings are starting to show up now with microprocessors. That is a whole new level of technology that we have not yet exploited," he said.

Gould believes such savings need not be limited to banks. Any company which can reduce its normal business operations to an individual transaction basis can benefit from the philosophy pioneered at Citibank, he said.

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Seminar Attendees Tell Commission

EFT Standards Needed for More Than Plastic Cards

By Edith Holmes
Of the CW Staff

GAITHERSBURG, Md. — Standards for plastic cards used in an electronic funds transfer (EFT) system have received far more attention than the consumers it will serve, according to participants at a two-day seminar at the National Bureau of Standards (NBS) here recently.

Convened by the National Commission on Electronic Fund Transfers, the meeting also identified a need to create standards that will permit information interchange within and between communications networks.

The commission called the seminar in part to fulfill its promise to make an intensive study of the standards essential to EFT operations, be they national or international [CW, Feb. 28].

Urging the workshop's 67 participants from banks, equipment manufacturers, trade associations and federal agencies to "think interchange," the commission began the meeting with the assumption that no interchange of information will occur without standards for plastic cards, consumers, communications protocols, numbering systems and message formats. "proof of transaction" information.

Under the heading "Human Interface," the consumer workshop placed a high priority on the development of basic transaction advice and the way this information is conveyed to consumers. Certainly an account number and the dollar amount of the transaction are essential if a receipt is to be of any use, the group said.

A description of the purchase should involve many elements: the name of the institution as well as its city and state, the number of the transaction, the type of transaction, the date and perhaps the time that it occurred and the authorization number if that is different from the transaction number.

A particularly "hot" topic for the workshop group was the level of detail used to describe the transaction. If a person purchases a mink coat, for example, should the receipt read "mink coat," "ladies wear" or "merchandise"?

Top priority and attention should also be given to the statement contents and formats received by the public, the group concluded.

Cross-reference numbers should be provided to permit reconstruction of the transaction. The user's identification should appear on the statement as well.

Statements should also provide some means for the consumer to verify that the transaction actually took place. Still another "hot" item in this area is the extent to which statements should provide information about disclosures of transactions under government regulatory requirements, the group stated.

Standards should be developed for "proof of transaction" information. The efficiency and privacy considerations inherent in this information, however, were considered by the group to be outside the realm of standards setting.

Its members suggested the human interface aspect of EFT systems is a marketing issue to some extent, but an area that lacks much information.

Consumers might be aided in their use of EFT systems by being able to select their own personal identification and by using symbols that would be standard to a variety of transaction machines. This would further aid those users who are illiterate and also permit standardization of keypads, on point-of-sale and automated teller machines.

Communications Standards

Standards need to be written for communications protocols between networks and external data terminals, the group discussing this topic maintained.

Higher level and end-to-end protocols for EFT systems should include error detection and recovery, security — possibly through encryption, audits for accounting purposes and addressing techniques, attendees agreed.

Any EFT system will depend on a multilevel communications concept. The interface between these nodes, network and higher levels should be "implementation independent," the group said.

There should be standards to facilitate the intra and internetwork use of terminals and standards to permit network coexistence and compatibility, the communication protocols group added.

The group also recommended work be started to describe EFT networks functionally and to expedite the understanding of standards created for communications protocols through education.

The EFT commission was provided with a list of 35 to 50 standards in the communications area already in effect.

Numbering Interface

The total interface of the several numbering systems now in use in separate EFT systems will require considerable revision, the workshop group devoted to this topic said.

Numbering systems, like the one promulgated by the ANSI credit card standard and another used by the the American Bankers Association and the Federal Reserve System, are adequate for now and efficient for their particular applications, the group stated.

Though necessary for information interchange, numbering systems draw no real consumer interest and no security problems in and of themselves.

Finally, the group dealing with message formats noted that standards for all these areas are interdependent where an EFT system is concerned.

There are no published standards for message formats, although the format used between the airlines and credit card companies constitutes a de facto standard, the group pointed out.

Network-to-network message formats are needed if EFT is to go beyond separate institutions and applications. Switch-to-switch message formats are needed if EFT is to be national, the group added.

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DPers Battling Arctic Climate To Devise System for Oil Flow

By Ivan Berenyi
Special to Computerworld

PRUDHOE BAY, Alaska — Deep inside the Arctic Circle here, a team of British systems analysts and programmers are battling temperatures that can reach -150° F to devise a system that will control oil flow from British Petroleum's (BP) Alaskan oil field.

As much as possible of the production of the North Slope oil is to be automated to minimize the need for staff permanently stationed at this inhospitable site. The hardware, under development for the last three years, will come from Honeywell's Process Control Division. It will include two 56K-byte HS 4400 computers, two 1.3M-word drum memories, six color CRTs and three high-speed printers.

Pressurized oil will be extracted from the well heads and pumped to three centers. There it will pass through a series of separators to extract the gas as the pressure of the oil-gas mixture drops.

The gas will then be injected back into the wells while the oil is cooled and pumped on to the Alyeska pipeline terminal, where it begins its journey through the trans-Alaskan pipeline to Valdez on the Alaskan south coast.

At the gathering centers, the gas separation process will be controlled entirely by computer, monitoring more than four thousand alarms and registers in the field on a regular basis. Well-flow testing — carried out periodically to check that operating characteristics remain constant — will be automatically scheduled and performed.

Most important of all, the flow of oil to Alyeska's receiving terminal will be controlled precisely to meet the pipeline company's requirements.

Because of the possibly unique operating conditions, the consulting team from BP's London subsidiary, Scicon, have designed a high degree of redundancy into the system, as well as requiring maximum component reliability from the Honeywell system. The design team has been working on the system's development at Honeywell's Phoenix center and the hardware has undergone rigorous testing.

Installation has already begun, and the team is scheduled to hand over the whole system to BP Alaska Operations next month.

As a wholly owned subsidiary of a major oil company, Scicon is qualified to undertake projects of this kind. "In our early days we found that we were involved in just one technical area — linear programming. But over the years we have handled an enormous range of oil applications including: exploration, production, marketing, shipping and refining," the company's oil industry marketing manager, Philip E. Hirst, said.

"About six years ago we looked very hard at this market, trying to identify trends and recurrent work, and from that time we adopted a very serious attitude to the oil industry. It's reassuring that oil companies' problems are essentially the same — far more than in other industries.

"The differences are more in parameters than anything else. Experience once acquired will help in a dozen situations," he commented.

Of the BP system in Alaska, Hirst said: "True closed-loop control in this area is almost unknown. The Alaskan system is the most advanced of any at this time, even including those in the planning stages."

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WANG

'Old World' Giro Suggested as EFT System for U.S.

By Toni Wiseman
Of the CW Staff

NEW YORK, — "The American Giro system is, to paraphrase Rousseau, an idea that has come and it is about time," according to Kevin J. Kearney, submanager at the Bank for International Settlements, in Basel, Switzerland.

Addressing the Bank Administration Institute's Interindustry Conference on Corporate-to-Corporate Electronic Fund Transfer Systems (EFTS), Kearney suggested U.S. bankers can benefit from a close look at the payment mechanism in the "Old World," where Giros — checkless credit transfer systems — are an accepted concept.

While some bankers think of Giros as automated clearinghouses and vice-versa, Kearney defined a Giro as a central system for exchanging debits and credits.

Giros, he stated, result in efficiency, volume and cost benefits both to the payer and payee and to the financial institution.

At present, for instance, a French importer's payment to a German exporter could conceivably involve six banks with up to seven transactions among them.

While the costs of corporate-to-corporate payments transactions in the international sector are largely covered by bank charges and the resulting exchange earnings, Giros and a network such as Swift will greatly aid such a series of operations and reduce the costs within the sending and receiving banks, he stated.

Over 50% of Transactions

A German research institute recently estimated over 50% of all transactions in Belgium, Germany, The Netherlands and Sweden (over 70% in Germany and The Netherlands) were Giro debits, Kearney told the audience of bankers and corporate officers.

Eighteen million or 65% of all interbank payments in Switzerland passed through the Zurich-based Giro, he added.

"What is interesting, however, is to realize what a small percentage of the total number of Giro payments this represents (about 3%) since the post office Giro handled 450.6 million transactions," Kearney said.

Two Zurich Giros

Kearney discussed various European Giros, including the two which service Switzerland — the bank and postal Giros — noting that in the past 10 years the payment volume in Switzerland has grown from 250 billion to 500 billion transactions.

The bank Giro in Zurich is a magnetic tape system which enables bank clients with their own DP installation to send magnetic tapes containing the accounting number of their employees and instructions for the direct deposit of specified amounts to the employees' individual accounts.

The bank Giro can handle a variety of payments including:

Payments in Swiss francs in Switzerland.

Salary payments in Swiss francs.

Postal Giro payments in Swiss francs.

Payments in foreign currencies within Switzerland.

Payments to foreign banks in either foreign currencies or Swiss francs.

Payments by check in Swiss francs or foreign currencies.

The client can also fix the date on which the payment is to be made, he noted.

The tape containing the payment orders must be accompanied by a signed bank payment form stating the total amount of payments on the tapes, Kearney said. After processing by the bank Giro, the receiving banks can enter the payment orders directly on their computer system because such things as the data formats and tape-labeling procedures are firmly set out in the interbank standards agreements, he added.

The Swiss National Bank operates as the clearing center for the 190 financial institutions (with a total of more than 500 branches) participating in the bank clearinghouse system, he said.

"From an organization point of view, it is significant that all the clearing centers — of which there are seven — except that of the Kantonalbank von Berne — are located in Zurich. The bank clearinghouse system — unlike the postal Giro with 25 offices — thus has a highly centralized processing structure," he said.

The bank Giro has also added a direct debit service created for the insurance, gas and electric companies which receive variable payments, opposed to the more traditional standing order type of payment for rent and mortgage, he indicated.

Unlike the bank Giro's magnetic tape operation, the postal Giro has lowered its cost per transaction by two-thirds through the use of optical character recognition for the automated handling of debits and credits, Kearney said.

Since 1957, the number of postal Giro transfers has increased from less than 250 million to 450 million and the turnover from 1.5 billion to 8 billion Swiss francs. In addition, the postal administration realized a profit of 160 million Swiss francs in 1976.

"If the U.S. postal administration were as efficient on a per capita basis, it would earn a profit of over $2.2 billion," Kearney noted.

Not an Acronym

NEW YORK — Giro is not an acronym but originally the name of a bank in Hamburg, Germany, according to Kevin J. Kearney.

In 1619, the "Giro Bank" developed a system of checkless credit transfers between banks as a means of coping with an ever-increasing volume of paper.

Giro is the German derivative of the Italian word "rialto." The derivation occurred because the first known Giro operation was carried out by Venetian merchants.

These merchants, all of whom maintained accounts at the Bank di Rialto, would meet there periodically to exchange credits and debits on their ledgers.

"While one can conjure up an image of a group of merchants seated around a large revolving table, each writing offsetting entries in another merchant's books and spinning the table to write in the following set of books, we have no supporting evidence to hear this out," Kearney said.

What is important is that all the accounts were maintained at the one bank to facilitate final settlements, he said.

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#2: Data entry, the easy way.

On-line data entry has real advantages over stand-alone systems. 100% editing against your database is one of them. The fact that you can use your existing general-purpose terminals is another. Immediate processing is a third. The list goes on and on.

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During entry, data may be validated automatically using a variety of techniques including:

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- Calculations
- Check digits
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- Field presence/absence
- Numeric/alphabetic
- Ascending/descending
- Selective verification

If that's not enough, Data Entry can transfer control to user-written application programs at strategic points in the entry process for special editing or access to a database. This ability to incorporate "user exits" into the data entry function permits 100% validation of data and immediate file update.

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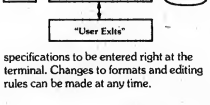

specifications to be entered right at the terminal. Changes to formats and editing rules can be made at any time.

Captures Data at the Source

The obvious advantages of on-line data capture are only part of the story. TASK/MASTER's Data Entry also allows "distribution" of the data entry function directly to the end user. This can dramatically reduce administration costs, improve user satisfaction, and increase overall data accuracy and security.

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Photos by Matt Hinton

New Masters

By William R. Feeney
Special to Computerworld

Everyone has seen plotter- and printer-produced pictures. But can computers make sculptures?

Probably not, but they sure can help.

A very difficult stage in producing sculpture is visualizing how the final piece will look once the sculptor has decided upon an idea. Drawing sketches helps, but they are limited to two-dimensional views.

The sculptor needs an easy way to produce three-dimensional models of what the finished pieces will look like. This is so he can rotate the piece, viewing it from all angles before constructing it in the final medium.

Without explicit instructions on how to construct complex sculptures requiring assembly, making models is too time-consuming a process and requires too much trial and error.

Computer systems can produce models in several ways. A sophisticated interactive graphics system can be programmed to rotate a sketch so the artist can view it and make changes if desired.

A less elaborate system can draw sketches and provide assembly instructions for potential pieces of sculpture. Quickly assembled models can then be constructed. My sculpture was designed by the second method.

This is the first of monthly Computerworld *features on computer art. Artists who wish to contribute material should contact Nancy French, managing editor.*

The program to design these sculptures was written in Basic for a Digital Equipment Corp. PDP-11/45. The program requires the input of a "seed" three-dimensional form or, in other words, a form which is used as a point of departure for the transformations to follow.

The seed form for the pieces shown is a dodecahedron, a member of the family of regular polyhedra. The dodecahedron characteristically has 12 faces (each face having five edges) and 20 vertices.

The seed form is then transformed by the design program in accordance with the directions given by the sculptor. The form can be elongated, sheared or, for some forms, tapered. Even after the transformations, the characteristics of the seed form are retained, but the shape of the transformed form is quite different in appearance.

The program outputs the shapes of the transformed faces and special assembly instructions for that piece. From this information, cardboard models are made.

Once a model has been chosen to be constructed in steel, the faces are cut from steel plate and then welded together in accord-

(Continued on Page 12)

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Calendar

April 25-28, Chicago — **Computer Audit, Control and Security,** sponsored by the Institute of Internal Auditors, Inc. (IIA) and Automation Training Center, Inc. Contact: John J. Sheehan, IIA, 249 Maitland Ave., Altamonte Springs, Fla. 32701.

April 27-29, Chicago — **Minicomputer Applications Conference,** sponsored by the American Institute of Industrial Engineers (AIIE). Contact: Diane Summers, Department PR, AIIE Seminars, P.O. Box 3727. Santa Monica, Calif. 90403.

May 2-3, Newport, R.I.— **CVIS Consortium Sixth Annual Conference.** Contact: Marilyn Carson, 100 Skyport Drive, San Jose, Calif. 95110.

May 2-3, New York — **Marketing Strategies for Selling to Users of Remote Computer Services.** Contact: Jeff Schwartz, Frost & Sullivan, Inc., 106 Fulton St., New York, N.Y. 10038.

May 2-5, Anaheim, Calif. — **Instrument Society of America (ISA) Spring Industry-Oriented Conference and Exhibit.** Contact: Gail Milby, ISA, 400 Stanwix St., Pittsburgh, Pa. 15222.

May 3-7, Venice, Italy — **Eurocon '77,** sponsored by the Institute of Electrical and Electronics Engineers, Inc. Contact: Eurocon '77 Office, c/o AEI Viale Monza 259, I-20126 Milano, Italy.

May 4-6, London — **12th Annual International Input/Output Systems Seminar.** Contact: Input/Output Systems Association, P.O. Box 1333, Stamford, Conn. 06904.

May 9-12, Chicago — **Design Engineering Show.** Contact: Clapp & Poliak, Inc., 245 Park Ave., New York, N.Y. 10017.

May 9-13, New York — **On-Line Systems and Data Base Systems,** sponsored by the American Institute of Industrial Engineers (AIIE). Contact: AIIE Seminars, Department PR, P.O. Box 3727, Santa Monica, Calif. 90403.

May 10-12, Brussels — **Compec-Europe,** sponsored by *Computer Weekly* and *Data Processing.* Contact: Chris Hipwell, Computer Weekly, Dorset House, Stamford St., London SE1 9LU, England.

May 11-13, Anaheim, Calif. — **Southwestern Region I Conference,** sponsored by the Orange Coast Chapter, Data Processing Management Association (DPMA). Contact: Emmet E. Rixford, DPMA Orange Coast Chapter, P.O. Box 2957, Anaheim, Calif. 92804.

May 11-14, Chicago— **Focus 77 — A New Approach to Technical Communications,** sponsored by the Society for Technical Communication. Contact: 24th International Technical Communication Conference, Office 105, 7121 N. Ridge, Chicago, Ill. 60645.

May 12-13, Washington, D.C. — **Institute on Federal Publishing, Printing and Information Policy.** Contact: Dr. L.H. Hattery, American University, Washington, D.C. 20016.

May 12-13, Madison, Wis. — **Patent Law for Engineers and Scientists.** Contact: Prof. Robert J. Smith, Program Director, Engineering Department, University of Wisconsin, 432 N. Lake St., Madison, Wis. 53706.

May 13, Columbus, Ohio — **Data Management and Data Base Technology Symposium,** sponsored by the Association for Computing Machinery. Contact: Dorothy Smith, E.S. Preston and Associates, 939 Goodale Blvd., Columbus, Ohio 43212.

ICCP Slates New Examination To Certify Senior Programmers

CHICAGO — The Institute for Certification of Computer Professionals (ICCP) has announced a new examination for senior-level computer programmers who wish to obtain a Certificate in Computer Programming (CCP).

The examination for a CCP as opposed to a Certificate in Data Processing (CDP) will be offered at more than 125 test sites around the world on Oct. 22.

Offering a certificate to the senior-level computer programmer is a new venture for the ICCP, according to a spokeswoman.

The idea for such an exam grew out of the test for certification as a Registered Business Programmer (RBP) offered by the Data Processing Management Association before ICCP took it over. ICCP discontinued the RBP some time ago.

Three separate examinations will be offered: business programming, scientific programming and systems programming.

Among the areas to be tested are data and file organization, principles and techniques of programming, programming languages, interaction with hardware and software, interaction with people and questions appropriate to business, scientific and systems programming applications, the ICCP said.

The exams will contain up to 250 questions, and candidates will have one-half day to complete them. An individual may sit for any one or all of the programming examinations, but may take only one per year.

Those who completed the RBP exam a few years ago will automatically receive a CCP certificate sometime this year.

Additional information can be obtained from the ICCP at 304 E. 45th Street, New York, N.Y. 10017.

DP Helps Sculptor Visualize His Work

(Continued from Page 10)

ance with the instructions.

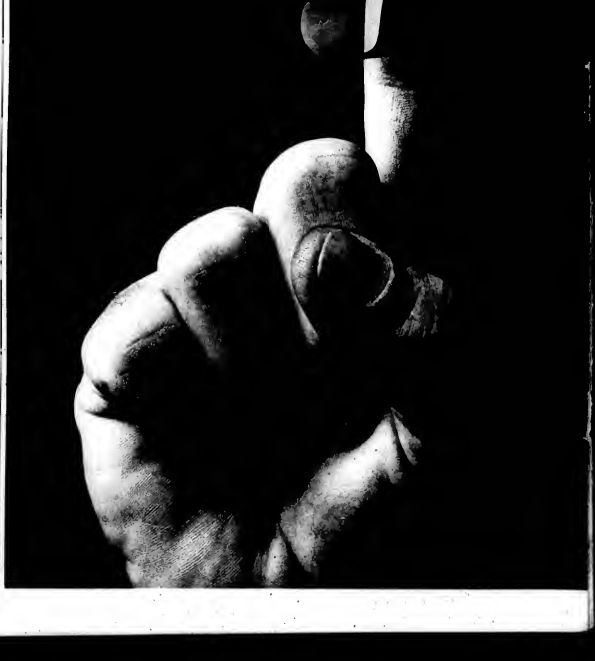
Finishing the forms requires removing the firescale, grinding the edges and polishing the faces. The natural polished steel sheen gives the nicest appearance found so far. The polished surface is treated with a clear plastic coating to prevent oxidation.

The final pieces have a precise geometric quality about them, but at the same time are clearly hand-crafted with the effects of welding being subtly evident. Most of the pieces are mounted on a narrow steel pedestal which rests on square, hardwood bases. The bases are typically teak, rosewood, walnut or oak.

Other pieces are left unmounted. They are more monolithic in impression and are intended to be handled.

The pieces produced thus far range in height from seven to 15 inches, although larger forms are possible. When a piece is sold, the computer output used to make the piece is included.

Feeney is an assistant professor at San Diego State University. He previously worked with computer manufacturers and in the aerospace industry. His academic training has been in physics, mathematics, experimental psychology and information systems.



Reform Act May Have Unforeseen Results, Panel Says

By Ronald A. Frank
Of the CW Staff

WASHINGTON, D.C. — The telecommunications debate begun by AT&T's introduction of the Consumer Communications Reform Act may result in future policies never foreseen by the phone company, speakers at a recent DataComm 77 session dealing with regulatory issues agreed.

Dr. Manly Irwin, regulatory expert and professor at the University of New Hampshire, said current studies on how telecommunications should be regulated may be misdirected.

Rather than how to regulate, the more basic question may well be whether to regulate at all, he said.

John Eger, former acting director of the Office of Telecommunications Policy, agreed regulation may be unnecessary and asked, "Whatever happened to the best regulator of all — the consumer?"

The antitrust suit launched by the Justice Department against AT&T is "easily 10 years away" from being decided, Eger said.

He indicated the resolution of the issues raised by the Reform Act would be settled first and the decision on the future of competition in telecommunications will be "one of the most important in the third century of our country."

TNS Furtively Marketed

Eger took issue with Transaction Network Services (TNS) of AT&T. The service has been tariffed in only two states, but it is being marketed "by stealth outside the scrutinous eye of federal regulators," he said.

He described TNS as the "Systems Network Architecture" of AT&T.

Philip Permut, chief of the Federal Communications Commission's (FCC) Policy and Rules Division, said that under the Communications Act of 1934 there really is no option available to deregulate some carrier services.

But, he added, user pressures, especially from the DP area, had clearly "caused the FCC to make some of its procompetition rulings. Even if the Carterfone decision had not taken place, the issue would inevitably have been forced in some other manner."

Federal Agency Should Decide

Michael Barnes, a member of the Maryland Public Service Commission, said he personally thought the Reform Act was wrong in wanting the state regulatory commissions to decide interconnection standards.

It is "not clear that what we have been doing is so marvelous that it should be carved in stone by the U.S. Congress," he said. The best place to develop standards for a nationwide network is a federal agency like the FCC, he added.

It is possible Congress may eventually decide only the phone line to the customer premises and nothing else should be regulated, he said.

The panel agreed the competitive issues not related to plain old telephone service, which should continue to be provided strictly by the telephone companies.

System 'Recalls' Faulty Vehicles

DETROIT — A computerized system used by General Motors Corp. to track vehicles recalled for safety repairs found that owners of 22,000 such vehicles failed to bring them to dealers to get that work done.

The Computerized Recall Identification System (Cris) provides instant information to dealers as to whether recall work has been done on GM vehicles in their inventories and also those that come in for service, according to GM service director O. Robert Pansa.

The data base contains vehicle identification numbers on vehicles still needing safety repairs required under recall campaigns initiated since Oct. 1, 1970, according to GM.

For a printed response, dealers access the system via a teletypewriter terminal. For a computerized voice response, they may use a Touch-Tone phone, according to GM.

The system is operated on General Electric Co.'s time-sharing network, and information is updated monthly via magnetic tape.

Texas Archeologists Use DP to Analyze Old Indian Artifacts

By a CW Staff Writer

SAN ANTONIO, Texas — Ancient artifacts left by Indians who lived here thousands of years ago are being studied and analyzed electronically to discover more about their daily lives and culture.

Dr. Joel Gunn, professor at the University of Texas here, is using the university's IBM 370/155 and 158 to determine the concentration of similar artifacts in the Lyndon B. Johnson State Park area.

The numbers and kinds of artifacts tell what areas of the site were used for cooking and tool-making and how technically advanced the people were at each of these chores, he said.

The site was divided into 20-meter-square grids, allowing the location of each artifact to be pinpointed to within one centimeter or .3937 inch, Gunn said.

Approximately 30,000 artifacts have been gathered, logged and classified by the techniques used in making the projectile, he said. The oldest projectile found so far is an arrowhead dating from 3500 B.C., Gunn said.

Projectiles are the most accurate means of judging time eras because they come in fads, he said. "The faster they come and go, the better we can tell" at which level of sophistication they were, Gunn said.

The computer is used to count the artifacts, log them and make estimations as to their use. Gunn used preprogrammed packages of factor analysis, regression and linear analysis, he said.

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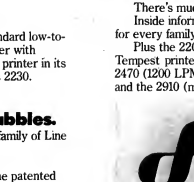

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Editorial

Privacy: Exaggerated Costs?

The report published recently by the Office of Management and Budget (OMB) indicating the implementation of the Privacy Act of 1974 cost less than one-seventh of original estimates was encouraging to those who value their personal privacy.

OMB's survey of 85 of 88 federal agencies indicated funds spent on setting up and then operating under fair recordkeeping standards between Sept. 27, 1975 and Sept. 30, 1976 were $36.6 million [CW, March 21].

Compare this with the earlier estimates: $200 million to $300 million annually over four or five years with an additional $100 million for start-up costs to be expended within the first two years.

This was the cost estimated for the House version of the act — the one most similar to the law finally passed.

It is dangerous and probably inaccurate to try to superimpose the implementation costs experienced by government agencies onto private-sector organizations.

But some of the wild estimates suggested by private-sector organizations in their efforts to dissuade Congress from enacting privacy legislation should be reevaluated in light of their findings.

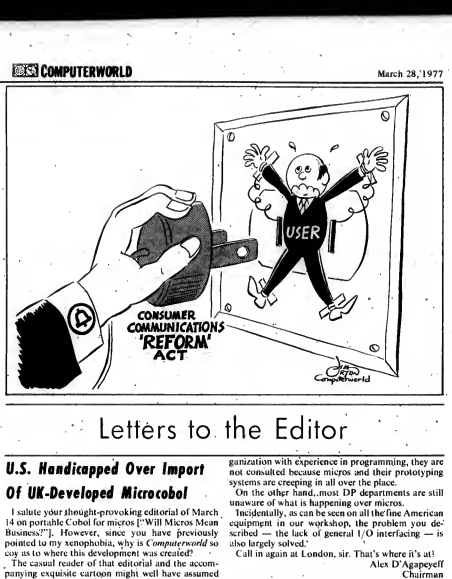
As expected, start-up costs — which included publishing information about the existence of records systems as well as establishing new internal procedures and training personnel to change their ways — devoured 81% of the total allocation.

Of that, publication requirements alone accounted for $13.5 million or 46% of the $29.5 million total.

Granting individuals access to records and keeping track of disclosures were responsible for the highest operational expenditures. Agencies reported spending $10.7 million or 29.2% of the total, granting individuals access to their personal information and $9.4 million or 25.7% keeping track of who else used it.

The work of the Privacy Protection Study Commission is drawing to an end. And judging from remarks recently made by its chairman, David Linowes, it is likely that the commission will be calling for strict fair information standards for private-sector recordkeepers.

The time has come for the private sector to reevaluate its objections. It might even find that protection of personal privacy is actually worth the cost.



Letters to the Editor

U.S. Handicapped Over Import Of UK-Developed Microcobol

I salute your thought-provoking editorial of March 14 on portable Cobol for micros ["Will Micros Mean Business?"]. However, since you have previously pointed to my xenophobia, why is *Computerworld* so coy as to where this development was created?

The casual reader of that editorial and the accompanying exquisite cartoon might well have assumed the development was made and available in the U.S. Or are your readers aware that Bloomsbury, London (formerly linked with Virginia Woolf), is now a center for advanced micro software?

In fact, the U.S. is handicapped over the import of this new technology. When distributors can sell one prototyping system per user per microprocessor, with this last changing frequently, who wants a facility which obsoletes prototyping systems for certain purposes (e.g., standard processor boards for DP, text processing and industrial controls)?

Yet many DP departments are finding that, although they may be the only section of the organization with experience in programming, they are not consulted because micros and their prototyping systems are creeping in all over the place.

On the other hand, most DP departments are still unaware of what is happening over micros.

Incidentally, as can be seen on all the fine American equipment in our workshop, the problem you described — the lack of general I/O interfacing — is also largely solved.

Call in again at London, sir. That's where it's at!

Alex D'Agapeyeff
Chairman
Computer Analysts and Programmers, LTD (CAP)
London, England

The news that CAP London had developed Microcobol was featured on Page 1 of the Feb. 28 issue. Ed.

Invitation to Seek New Situation

Congratulations, *Computerworld's* really doing a hang-up job for the employment agencies. Perhaps you should revise your subtitle to read "The Newsweekly for the Personnel Recruitment Community."

The article "Now's the Time to Dust Off Your Resume" [CW, March 14] certainly didn't make my job as a data center manager any easier. It was an open invitation for even the most loyal systems analyst or programmer to seek new employment.

I've been a subscriber to CW since the publication of your earliest issues. However, continued publication of similar articles will leave me with no alternative but to cancel my subscription.

Frank A. Crocitto
Upper Montclair, N.J.

DP Auditors Not Policemen

I was most dismayed to see a bold headline in *Computerworld* that internal auditors had been found to be a poor buffer against DP crime [CW, Feb. 28].

It was noted in the article that auditors lack experience and know-how. This may have been true many years ago, but the field of DP auditing has grown in numbers, prestige and influence during the 1970s. Auditors are not policemen, nor are they involved in the "crime-busting" business.

Particular evidence of the growing professionalism of DP auditing is given by the impact of our own organization, the EDP Auditors Association. The international organization is actively involved in "fostering the development of new DP control techniques and internal audit approaches along with requiring the development of control guidelines."

The EDP Auditors Association is closely involved in "defining the working relationship between users, auditors and the DP department" in metropolitan areas here and abroad. In these ways, it is shown that the best time to stop crime is before it happens.

John A. Gatto
President
New York Metropolitan Chapter
EDP Auditors Association
New York, N.Y.

Data Past

Five Years Ago
March 29, 1972

SANTA CLARA, Calif. — Memorex Corp. introduced what was described as the first distributed data processing system. The MRX/40, aimed at the IBM 360/20 user, was said to offer a tremendously powerful I/O processor.

— — —

LOS ANGELES — Los Angeles and Orange County assessors issued guidelines for the treatment of software as tangible personal property for tax purposes. Users, however, were thought to be free from the tax, as a bill pending in the California legislature exempted most programs from the tax roles.

Eight Years Ago
April 2, 1969

PHOENIX — General Electric Co. (GE) expanded its computer family with the introduction of two products. The Terminet 300, a teletypewriter for remote terminal and communications use, featured speeds of up to 30 char./sec, double the speed of the IBM 2740.

The GE 410, a time-sharing computer, served up to 10 user keyboards and could accommodate up to 40 connected terminals.

— — —

WASHINGTON, D.C. — Users were strongly represented on the Standard Control Language Committee of the USA Standards Institute. The group was formed to study possible standardization of computer control languages.

Discounts and Quality Preservation Pose DP Problems

By Jack Stone
Special to Computerworld

The reader response to my recent articles on training the non-DP-oriented top executives [CW, Feb. 7, 14] has been terrific.

Nearly 300 requests for my curriculum guidelines on this subject have been received, along with many notes, comments and letters, for which I am indeed grateful.

Most of the respondents, by the way, were executives and DP managers.

As a result of this intense interest, I am preparing a new series of articles for the DP manager which will appear in this column from time to time.

I intend to identify those knotty problems which I believe plague today's computer centers and to provide suggestions and guidelines for how these problems can be addressed.

I will focus on the supervisory rather than the technical aspects of the management function since I believe the development of the personal capabilities and skills of DP managers and their executives is a new and major growth area in this wild business.

I will try to cover the impact of the upcoming technologies — such as distributed processing — upon the roles, functions and activities of DP management.

Please let me know of any specific issue or problem you would like to have presented.

As a starter, I think it would be useful to summarize my views on current DP management problems.

The following is the "session abstract" of a panel I'll be chairing at the National Computer Conference titled "Humanistic Perspectives on Computer Center Management."

"There exists an incredible, if not bizarre, lack of attention by computer center managers to their primary responsibility: directing and leading computer people.

"Faltering managerial leadership blunts personnel motivation to develop DP systems with high levels of excellence.

"The results? Inefficient and uneconomic systems, even though the work does "get out the door."

"Five panelists — representing viewpoints of consultants, federal government, industry, the media and the university community — provide some insights into this newest management challenge."

I should note that the five panelists will be, respectively, myself; Paul Dyer, from the Census Bureau; Bill Burns, from E-Systems; Don Leavitt, from *Computerworld*, and Janis Arcinofsky, from Southern Methodist University.

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Bill correctly identified one problem that many senior DP managers face in dealing with their superiors — namely, a lack of appreciation by the executives of the nature, complexities, costs and resource needs for successful software development.

Dear Jack:

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I have seen the effect of these interface problems for over 20 years but, thank heaven, I [have seen] some improvement, especially in the past five years or so.

Unfortunately, we still have a long way to go.

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The Taylor Report
By
Alan Taylor, CDP

There is no question that the provision of mass production makes them inevitable, and there is nothing to be surprised about in having them in the DP field. Yet, there are problems ahead if this becomes the way of life.

The major problem relates to quality — particularly to software or service quality. The standard terms for the provision of hardware, software, almost anything leave the question of quality wide open.

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Nor are the Realcoms the oldest vintage systems being replaced. Another one is a Honeywell 800 — which I think came out in the late '50s. At that time, we thought the life of computer hardware was around five to seven years. This thing is still plugging away and seems to reach the 20th anniversary of its debut.

Future Developments

The plain fact is that computers and software don't wear out, but the support engine that keeps their quality up during the direct few years often does.

Support is basically derived from marketing and, while the computers themselves still work, there are few, if any, continuing marketing dollars around for the provision of support services that aren't very explicit in the contracts.

So far, we are only meeting up with the edges of the problem — the components and services of the 50/60 interface. Just wait a few years and see the complexities of what is to come.

What we need is a better but not one-sided way of handling services. It is as unreasonable for a user to expect that he will always be able to get trained software people for some small percentage of the hardware price. It is also unreasonable for the vendor to expect to be able to supply service at a high "hours worked" rate without any guarantee that the so-called expert has ever seen the software he is patching or that he is documenting his work — especially when the price is discounted.

Of course, an "expert" doesn't document his work, then no one coming after him has a fair chance to understand what the current situation is or else to see whether the work has been done properly.

It is possible that some work can be done properly — in that the system starts putting out correct payroll checks again, for instance, while introducing another latent bug somewhere else while doing so.

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Another whole area that is missing from current quality considerations is the quality of work supervision. Most contracts just don't even mention such a subject — leaving the user apparently at the tender mercy of a series of unsupervised "service" and maintenance people.

This is clearly not necessary; supervision quality is a very important element. There is no reason why a vendor should not agree to provide adequate quality of supervision of services at the same time that he is providing such services.

A third area which is not being addressed is the data base of information about the service area that will be maintained; it is available to vendor and service people alike.

It is clearly dangerous for a user to expect that everyone who arrives to provide service or everyone who sends in a software patch has checked through the full data base of known information. It is dangerous even to think that any such data base is in existence.

Similarly, it is one-sided for a vendor to think that he can get away with sending someone out who has seen a colored brochure about the product and has some familiarity with some other, perhaps later but different, version.

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Certainly, not everything in the world should be opened to the user. Internal reviews, for example, are no concern of his. But basic information such as the use of diagnostics, available methods of testing, limitations and dangers involved and manuals should be made available.

Whether or not complaint logs received regarding such diagnostics should be included is probably a matter of opinion. Some complaints are inaccurate and, some, contain technically wrong statements. These are dangerous if believed.

On the other hand, other complaints may well be the only source of accurate information about what happens if manuals are literally followed, so they can be essential to the care and keeping of the operation.

There probably are some other things that will have to be considered, but all are certainly needed in one form or another. They are needed whether or not there is any actual trouble — and they have to be paid for naturally.

This is perhaps the biggest problem. There simply are no provisions for users to realize what the cost of keeping this general expertise going is or how it can be kept down.

Contracts that don't talk in terms of supervision quality, work quality, data base availability, testing methods to be used, etc. leave the user thinking all he has to do is get someone to come in and pay for his time.

It just isn't that simple with systems that will keep on running and through discounts that will prove attractive in the future.

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Editorial

Privacy: Exaggerated Costs?

The report published recently by the Office of Management and Budget (OMB) indicating the implementation of the Privacy Act of 1974 cost less than one-seventh of original estimates was encouraging to those who value their personal privacy.

OMB's survey of 85 of 88 federal agencies indicated funds spent on setting up and then operating under fair recordkeeping standards between Sept. 27, 1975 and Sept. 30, 1976 were $36.6 million [CW, March 21].

Compare this with the earlier estimates: $200 million to $300 million annually over four or five years with an additional $100 million for start-up costs to be expended within the first two years.

This was the cost estimated for the House version of the act — the one most similar to the law finally passed.

It is dangerous and probably inaccurate to try to superimpose the implementation costs experienced by government agencies onto private-sector organizations.

But some of the wild estimates suggested by private-sector organizations in their efforts to dissuade Congress from enacting privacy legislation should be reevaluated in light of their findings.

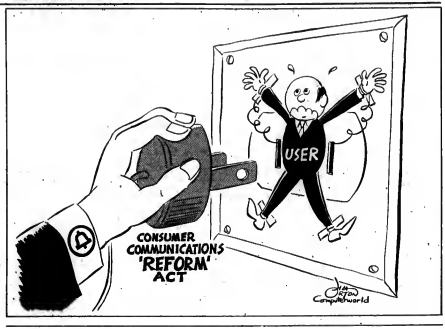
As expected, start-up costs — which included publishing information about the existence of records systems as well as establishing new internal procedures and training personnel to change their ways — devoured 81% of the total allocation.

Of that, publication requirements alone accounted for $13.5 million or 46% of the $29.5 million total.

Granting individuals access to records and keeping track of disclosures were responsible for the highest operational expenditures. Agencies reported spending $10.7 million or 29.2% of the total, granting individuals access to their personal information and $9.4 million or 25.7% keeping track of who else used it.

The work of the Privacy Protection Study Commission is drawing to an end. And judging from remarks recently made by its chairman, David Linowes, it is likely that the commission will be calling for strict fair information standards for private-sector recordkeepers.

The time has come for the private sector to reevaluate its objections. It might even find that protection of personal privacy is actually worth the cost.



Letters to the Editor

U.S. Handicapped Over Import Of UK-Developed Microcobol

I salute your thought-provoking editorial of March 14 on portable Cobol for micros ["Will Micros Mean Business?"]. However, since you have previously pointed to my xenophobia, why is *Computerworld* so coy as to where this development was created?

The casual reader of that editorial and the accompanying exquisite cartoon might well have assumed the development was made and available in the U.S. Or are your readers aware that Bloomsbury, London (formerly linked with Virginia Woolf), is now a center for advanced micro software?

In fact, the U.S. is handicapped over the import of this new technology. When distributors can sell one prototyping system per user per microprocessor, with this last changing frequently, who wants a facility which obsoletes prototyping systems for certain purposes (e.g., standard processor boards for DP, text processing and industrial controls)?

Yet many DP departments are finding that, although they may be the only section of the organization with experience in programming, they are not consulted because micros and their prototyping systems are creeping in all over the place.

On the other hand, most DP departments are still unaware of what is happening over micros.

Incidentally, as can be seen on all the fine American equipment in our workshop, the problem you described — the lack of general I/O interfacing — is also largely solved.

Call in again at London, sir. That's where it's at!

Alex D'Agapeyeff
Chairman
Computer Analysts and Programmers, LTD (CAP)
London, England

The news that CAP London had developed Microcobol was featured on Page 1 of the Feb. 28 issue. Ed.

Invitation to Seek New Situation

Congratulations, *Computerworld's* really doing a bang-up job for the employment agencies. Perhaps you should revise your subtitle to read "The Newsweekly for the Personnel Recruitment Community."

The article "Now's the Time to Dust Off Your Resume" [CW, March 14] certainly didn't make my job as a data center manager any easier. It was an open invitation for even the most loyal systems analyst or programmer to seek new employment.

I've been a subscriber to CW since the publication of your earliest issues. However, continued publication of similar articles will leave me with no alternative but to cancel my subscription.

Frank A. Crocitto
Upper Montclair, N.J.

DP Auditors Not Policemen

I was most dismayed to see a bold headline in *Computerworld* that internal auditors had been found to be a poor buffer against DP crime [CW, Feb. 28].

It was noted in the article that auditors lack experience and know-how. This may have been true many years ago, but the field of DP auditing has grown in numbers, prestige and influence during the 1970s. Auditors are not policemen, nor are they involved in the "crime-busting" business.

Particular evidence of the growing professionalism of DP auditing is given by the impact of our own organization, the EDP Auditors Association. The international organization is actively involved in "fostering the development of new DP control techniques and internal audit approaches along with requiring the development of control guidelines."

The EDP Auditors Association is closely involved in "defining the working relationship between users, auditors and the DP department" in metropolitan areas here and abroad. In these ways, it is shown that the best time to stop crime is before it happens.

John A. Gatto
President
New York Metropolitan Chapter
EDP Auditors Association
New York, N.Y.

Data Past

Five Years Ago
March 29, 1972

SANTA CLARA, Calif. — Memorex Corp. introduced what was described as the first distributed data processing system. The MRX/40, aimed at the IBM 360/20 user, was said to offer a tremendously powerful I/O processor.

— —

LOS ANGELES — Los Angeles and Orange County assessors issued guidelines for the treatment of software as tangible personal property for tax purposes. Users, however, were thought to be free from the tax, as a bill pending in the California legislature exempted most programs from the tax roles.

Eight Years Ago
April 2, 1969

PHOENIX — General Electric Co. (GE) expanded its computer family with the introduction of two products. The Terminet 300, a teletypewriter for remote terminal and communications use, featured speeds of up to 30 char./sec, double the speed of the IBM 2740.

The GE 410, a time-sharing computer, served up to 10 user keyboards and could accommodate up to 40 connected terminals.

— — —

WASHINGTON, D.C. — Users were strongly represented on the Standard Control Language Committee of the USA Standards Institute. The group was formed to study possible standardization of computer control languages.

Discounts and Quality Preservation Pose DP Problems

By Jack Stone
Special to Computerworld

The reader response to my recent articles on training the non-DP-oriented top executives [CW, Feb. 7, 14] has been terrific.

Nearly 300 requests for my curriculum guidelines on this subject have been received, along with many notes, comments and letters, for which I am indeed grateful.

Most of the respondents, by the way, were executives and DP managers.

As a result of this intense interest, I am preparing a new series of articles for the DP manager which will appear in this column from time to time.

I intend to identify those knotty problems which I believe plague today's computer centers and to provide suggestions and guidelines for how these problems can be addressed.

I will focus on the supervisory rather than the technical aspects of the management function since I believe the development of the personal capabilities and skills of DP managers and their executives is a new and major growth area in this wild business.

I will try to cover the impact of the upcoming technologies — such as distributed processing — upon the roles, functions and activities of DP management.

Please let me know of any specific issue or problem you would like to have presented.

As a starter, I think it would be useful to summarize my views on current DP management problems.

The following is the "session abstract" of a panel I'll be chairing at the National Computer Conference titled "Humanistic Perspectives on Computer Center Management."

"There exists an incredible, if not bizarre, lack of attention by computer center managers to their primary responsibility: directing and leading computer people.

"Faltering managerial leadership, blunts personnel motivation to develop DP systems with high levels of excellence.

"The results? Inefficient and uneconomic systems, even though the work does "get out the door."

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I should note that the five panelists will be, respectively, myself, Paul Oyer, from the Census Bureau; Bill Burns, from E-Systems; Don Leavitt, from *Computerworld*; and Julius Aronofsky, from Southern Methodist University.

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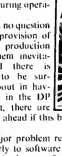
By
Alan Taylor, CDP



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Letters to the Editor

Check-Digit Checker Needs Improvement

In the Taylor Report of March 14 ["Classification Systems Helps You Check Your Check Digits"], Alan Taylor introduced a check-digit classification system which, although not without merit, could still be significantly improved.

In his description of the system, Taylor used the three-digit number 125 as an example and listed the 27 possible results of a possible single-digit mistake.

The next step of the system was to determine the percentage of these 27 possibilities that would pass the given check digit system and thereby go undetected.

The final step of this classification system was to perform the same such test to the entire set of numbers which must be checked.

The major flaw in his system comes from applying the same possibility of error to each of the 27 mistakes.

It is quite obvious to anyone who has ever studied keypunch errors that the greatest percentage of single-digit transliteration errors are those in which the entered digit is either three higher or three lower than the desired digit; this being the direct result of the layout of a standard 10-digit numeric pad.

Taylor also neglected to mention the possibility of multidigit errors which, although they are a bit less frequent and significantly more difficult to apply probabilities to that the single digit errors, are nevertheless quite important in the overall picture of the check-digit system.

I suggest that although the Riskalla/Taylor check-digit classification system is marginally adequate, it should be improved by the application of a weighted probability to each of the possible mistakes.

These weighted probabilities are best estimated by studying past data mistakes using the same data entry devices on which the check-digit system being investigated will be implemented.

D.T. Guidos
Torrance, Calif.

Soap Box Blatherings

When I received the March 14 issue copy of *Computerworld*, I found several interesting articles in the first few pages. But when I got to Page 19, I took a look at the headline over Alan Taylor's soap box and threw the bottom half of that page into the wastebasket.

For a long time now, he has beat the drum about the use of check digits, and I am as sick of his blatherings as Willard C. Cole has become over the "furor" regarding Certification in Data Processing ["To Be 'Professionals,' DPers Must Act Professionally," CW, March 14].

If Taylor wishes to expel (and copyright) his random bits of information, I suggest he write a book.

Then anyone who is truly interested in check digits and is also interested in reading Taylor may purchase the book and the half-page in CW can be used for some useful information.

Philip H. Kachelmyer
St. Paul, Minn.

Shuffle Off to Buffalo

According to the U.S. Weather Service, Buffalo, N.Y., has received 184.6 inches of total snowfall for the season — most of which has been melted and gone for some time. This is about 15-1/2 feet or about 80% of the figure reported in the article "Sink or Swim" [CW, March 14].

On March 11th, we also had a record high temperature of 69°, the only side effect of which was a minor epidemic of spring fever.

We appreciate the thoughtfulness of your concern, but if you would like a warm spot for a vacation, the Buffalo Convention and Visitors Bureau would be more than happy to send you some literature.

Robert P. Geleta
Buffalo, N.Y.

Best of Both Worlds

We all err on occasion, but your comment that "Buffalo still has 18 to 20 feet of snow on the ground" was a real goof, as evidenced by the fact that I spent the previous Saturday afternoon raking my lawn — with no snow in sight.

Granted, Sunday we went skiing, but that was 30 minutes south. Where else can you find the best of two worlds.

Robert Walker
Buffalo, N.Y.

Exam Disappointing

As a current Certificate in Data Processing (CDP) candidate, I was struck by the similarity of the comments made by A.V. Dundzila ["Quality of CDP Exam Material Seen in Need of Improvement," CW, March 7] to my thoughts of the past few weeks.

Like Dundzila, I will be surprised if I fail any part of the exam, since the questions were "easier" than I expected. I also used the MacGowen & Henderson "CDP Review Manual" and found it an excellent study aid.

I especially agree that availability of previous exams would be of assistance to future candidates and to persons evaluating the significance of the "certificate".

Also necessary for this evaluation would be the criteria for passing a section (i.e. Does the candidate have to answer 50 or 60 questions correctly, or just 35 or as much as 55?).

The test, while well-administered and packaged, was a disappointment. By my count, 14 of the 20 questions in the study guide were on the exam, and the same breakeven analysis question appeared in three different sections.

I also felt that the questions in the management section failed to test knowledge of theories of management, but rather retested knowledge covered in other sections of the exam.

Perhaps the "secrecy" of the contents of the exam and the passing criteria is one of the reasons it is not more widely accepted. If more people had a better idea of what is really required to pass the CDP exam, more qualified practitioners would invest the necessary time and money to take the exam.

Until more is known about the exam, we will continue to be greeted by comments such as "CDP, what's that?"

Steve Ryder
Austin, Texas

CP-6 Not Delayed

We appreciated the recent coverage of the Xerox Exchange meeting and the Honeywell announcements. I feel it necessary, however, to correct one part of your report.

CP-6 has not been postponed. In June 1976 discussions with our users, we were very careful to talk of a delivery range of last quarter of 1978 to the first quarter of 1979 since it was clearly too early to have been any more precise.

This project is now scoped well enough to raise our confidence so that we may focus in on a particular quarter, in this case the delivery target is the first quarter of 1979.

Sheldon Klee
Manager
Los Angeles Development Center
Honeywell Information Systems
Los Angeles

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Sources Ask Anonymity

The FAA System: Where There's Smoke, There's Fire

By Kennston W. Lord Jr.
Special to Computerworld

I'll be the first to admit I am not a qualified air traffic control system designer or air traffic controller. But I am a qualified pilot and airline passenger, have some understanding of the role computers play in the control of the operation and aircraft, know how computer systems are designed and, most importantly, am concerned over the ways the computer could possibly be used to disadvantage people.

It is becoming increasingly apparent that questions asked about the Federal Aviation Administration (FAA) control system are sensitive ones which are causing a stir among those who have heretofore enjoyed anonymity. In developing my previous articles on this subject, I have talked to many people, gained many insights and garnered sufficient information to prove, to myself at least, that all is not well with the system.

The majority of those with whom I've discussed the subject have indicated they have not felt at liberty to discuss what they know. Their answers have shown clear avoidance of the questions posed.

Those who have been willing to speak have a singular request: anonymity. So all may not be well with the FAA system, despite published claims to the contrary.

Responses Critical

Critics of the two articles ["Lord Called Not Knowledgeable About FAA System," CW, Feb. 14] have responded to add defenses and perspectives to the discussion. Their knowledge is certainly relevant to the question, but in their castigation they have raised yet some more pertinent and interesting questions:

- With knowledge that a near-miss [CW, Jan. 10] was the function of incorrect data, why did the FAA not see that the public was properly informed?
- If the near-miss was a function of the manual input of incorrect data, what were the pressures which caused the incorrect data to be entered? How often is incorrect data entered into the system? How easily can incorrect data be entered? What safeguards have been installed to reduce the incidence of incorrect data?

Could not the "projected enhancements" of the system have precluded the entry of incorrect data? And if such a near-miss was possible under accidental circumstances, is it not also possible under purposeful circumstances, whether or not any other checks and balances exist?

- Just how valid is the testing against "thousands of pages of specifications" for a system which has taken 10 years to develop and which is acknowledged by the critics to be both imperfect and incomplete? Why was the system so long in development? Were there outstanding difficulties?

What assurance does the flying public have that the system was thoroughly tested even over so long a time? Most certainly it is not aware that any knowledgeable and competent authority has conducted the tests and, as my critics have pointed out, the tests were not conducted by such an authority.

Again, the premise of these articles on the FAA air control system is that such a system should be developed and tested against legally mandated systems standards and that the tests should be conducted by persons with not only the knowledge but also the legal authority to do so, having first met minimum legal personal standards.

Building Code Parallel

Draw the parallel to the building codes, however enforced. Although the public may not know the language of the building code, it does know of its existence. More importantly, it knows the code inspector has the legal right to reject those structures which do not conform to code.

Here are additional questions.

- So what if it is possible for the controller to change the positioning of the identifying data on the screen? What guarantees exist that he will do so?

Why have the systems "wizards" who took 10 years to develop an admittedly incomplete system automatically not repositioned the data under program control when it is determined there is a potential conflict of the data presented?

If the controller is as busy and harried as sources would indicate, it seems doubtful that much time is available to allow such manual shifting of display data.

- So the system was developed by controllers for controllers. How nice. Who authorized the expenditure of tax dollars for the development of a system which would overlook the major element of the flying public? Did they get permission from Congress to avoid providing the ultimate protection?

Did they know how your system would disregard the people in the cockpit? It is fortunate that such an admission was made in print, for it lends credence to what has been published.

. . . And in This Corner

If, as alleged, the controller is busy making manual hand-offs to different sectors, then it seems logical the computer is "minding the store." If it's otherwise, then it remains to be demonstrated.

Of course 1976 was a burner year for air safety. After 1975, it had to be. But one cannot help but wonder if the system designed by FAA "wizards" was responsible for the most recent European air disaster, the largest in history.

Trojan Horses?

If the FAA exports a system which would allow a controller to make such a "mistake," is it not also possible that both the exported system and our own FAA system contain imbedded Trojan horses?

Other enlightening things were contained in the critics' commentary:

- When it becomes necessary to fall back to a manual mode of operation (126 FAA-acknowledged outages), the manual system to which they revert is at least 10 years old. Business couldn't survive with a 10-year-old manual system. Could the same

(Continued on Page 20)

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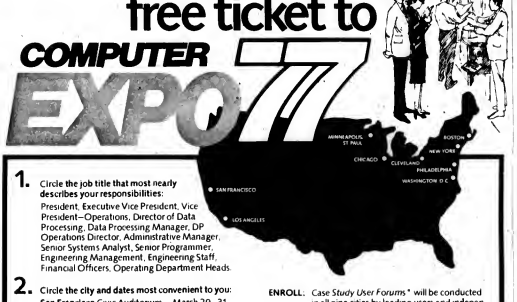

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To Be Effective

Procedures Require Standardization

By Richard Zaneski
Special to Computerworld

Every DP environment requires well-documented operating procedures. To be effective, they must be current and written for their principal users.

Various areas of the business world recognized the importance of operating procedures and developed standards for their creation. For the most part, they were successful and served the purpose.

However, expanding needs and a growth in the computer industry necessitated tighter procedural organization and a simpler written format.

Producing effective operating procedures requires standardization. Within this structure, each department of an organization must be recognized and a set of procedures developed for each.

To provide ease of reference within the procedural format, establish a coding system. The numbering scheme that is used must identify each procedure and its associated department.

For example, the first procedure of a systems and programming department could be coded SP-0001. Then additional procedures would be numbered sequentially.

The code number must be typed on each page of the procedure with the following areas of information:

- Procedure title.
- Person responsible for the particular job.
- Effective date of the procedure.
- Page number (page 1 of 6, 2 of 6, etc.

The balance of the page will be devoted to the actual procedure data. Ensure that all aspects of the job are explained and the individual functions detailed. To convey a personal tone, use the imperative tense in explaining step-by-step functions.

If any tables or illustrations are used, reference them in the text. Incorporate the tables with the text and place the illustrations at the end of the procedure.

After each procedure is complete, submit it for approval using a standardized cover sheet. This cover sheet should contain an area for approval signatures, revised and effective pages and distribution information.

Reader Commentary

When the procedure is approved and the cover sheet signed, make the necessary copies of the procedure and distribute them.

The master copy of the procedure and cover sheet must be placed in a master manual. Segregate each set of procedures by department. Place them in alphabetic order using the two letters of the procedure code number.

Then prepare the table of contents. Place it before each set of alphabetized procedures. Its information must contain all code numbers, procedure names and effective dates.

Constant updating of the table of contents is essential when new procedures and changes are written. If the table of contents and procedural text is not kept up to date, the master manual will lose its value as the prime source of operating procedure documentation.

Where There's Smoke, There's Fire

(Continued from Page 19)

he said for airline passengers?

- The original FAA disclaimer was that the system was tested by "The Airways Facility." The critics' commentary indicates that the system has had acceptance testing by "each Air Traffic Facility."

Not only is there a confusion as to the title of the testing agency, it now becomes apparent there has not been even a uniform testing plan.

And when the system was tested, was it with traffic in the air? Was it the only system in operation? Was radar duplexed to provide true parallel running? It's doubtful.

- Despite the fact that concern for air traffic control has existed for years, and particularly in 1975, how does it happen that only in 1977 do those "who have designed air traffic control systems" come forward with "this commentary"?

Where is the public pronouncement on the part of FAA? Where is the demonstration that the Trojan horse in the FAA system does not and in fact cannot exist? It would seem that it has not been done because there is no way to do it, as there is no standard in which the flying public can place any confidence.

If it is really desired for the public to inquire about air traffic safety, how has this input been encouraged?

Call me "not knowledgeable," if you wish. Tell me I'm wasting paper and ink. Claim that this is "sensationalism in its purest form."

But at the same time, remember that these items of information have not been figments of my imagination.

Some of you know where those vulnerabilities lie; it would seem that now would be the time to identify them.

There's a lot of smoke being blown in this issue. Where there's smoke, there has historically been fire.

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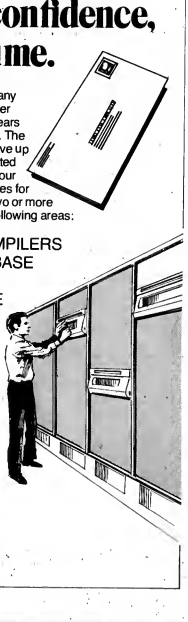

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Software Emerging For IBM Series/1

BIRMINGHAM, Ala. – A single-user Basic interpreter with enough instructions to demonstrate the calculation capabilities of IBM's Series/1 minicomputer is now available from Graham Computer Enterprises, Inc. (GCE).

The initial release does not support file handling or formatting of output destined for a printer. However, a multiuser version of the package with language features "equivalent to Dartmouth Basic" and including file and printer support will be out later this year, GCE said.

Despite its shortcomings, the first release provides a number of statement types, commands and arithmetic and relational operators. Statements covered include LET, FOR-NEXT, IF, GOSUB, GOTO, RETURN, STOP, REM, PRINT and INPUT. Commands available now are NEW, LIST, RUN, SAVE and LOAD.

The interpreter can handle up to 286 single-precision integer values plus one array and absolute value, random number and unused storage size functions, he added.

All versions of the package will operate in stand-alone mode without any need for an operating system, GCE said. The initial version can run on the minimum IBM Series/1 configuration which includes 16K bytes of memory, an operator station and a diskette drive, according to the spokesman.

The package costs $120 per CPU on a license basis. The fee may be applied to the fee charged for future releases, GCE said from Suite 106, 3 Office Park Circle, Birmingham, Ala. 35223.

Course From Edutronics Shows Sort/Merge Ideas

KANSAS CITY, Mo. – The Edutronics Group has released a course module entitled "Sort/Merge."

The module, based on ANS Cobol 1974, was designed as an in-depth course for programmers and operators.

Made up of an audio visual unit and an accompanying study guide with self tests, "lesson reinforcement materials" and "appropriate" exercises, the module illustrates coding techniques and efficiencies available to the user to save time and cost of program maintenance.

"Sort/Merge," as all Edutronics' modules, is distributed under a number of rental plans. Edutronics is at 3435 Broadway, Kansas City, Mo. 64111.

Replaces 'Coursewriter' 'TCP' Speeds Basic Running Under DOS

By Don Leavitt
Of the CW Staff

ITHACA, N.Y. – Although IBM's Coursewriter III can be used as a vehicle for run Basic under DOS or DOS/VS, it is less efficient and more expensive than the Time-Sharing Control Program (TCP) developed by CBM Associates here, a spokesman claimed.

The local group developed the Basic/Coursewriter system marketed by Southern Westchester Boces [CW, Jan. 31], the spokesman said it has "been aware of problems with Coursewriter for quite some time."

TCP was developed to be completely compatible with the IBM software so users moving from Coursewriter to TCP do not have to modify programs, files or registration information, he added.

Despite outward compatibility, the control program differs from Coursewriter in its internal organization. CPU scheduling, swapping decisions, disk scheduling, terminal handling and memory requirements have all been optimized under TCP, the vendor said.

In CPU scheduling, for example, Coursewriter uses a round-robin technique: each user must wait for all other users to get a time slice before regaining control. TCP supports dynamic priority assignments so users with simple needs get in and out quickly, the spokesman explained.

Coursewriter allows swapping to occur without regard to system activity, user priority or disk saturation. TCP decisions are said to be based on continuous system monitoring to avoid swapping users before they accomplish useful work.

Disk scheduling with Coursewriter is on a first-come, first-served basis "resulting in unpredictable head travel on each request. In contrast, TCP requests are queued and analyzed in groups so compatible requests are combined into one channel program," CBM said.

Terminal handling with TCP includes maintenance of information on the state of the various units and buffers tailored to message lengths. Coursewriter retains no terminal data and allocates large buffers independent of message length.

Coursewriter requires a minimal memory of 88K (of which 20K must be dedicated real storage under DOS/VS) while TCP needs only 56K, with no dedication of real storage under VS. With 25-line systems, Coursewriter needs 152K, but TCP 116K, CBM noted.

Dollar cost to the user is another way in which Basic/TCP is more advantageous than Basic/Coursewriter, the company claimed. Although the Basic portion costs the same $1,050/year in both systems, Coursewriter III adds another $2,775/year, to that, whereas TCP costs $1,500 annually.

CBM Associates can be reached c/o Thomas Murtagh, 204 Klinewoods Road, Ithaca, N.Y. 14850.

'Disk Basic Etc.' Puts Language, Operating System on 8080 Units

RICHARDSON, Texas – Disk Basic Etc. from Binary Systems, Inc. is a Basic language interpreter and what appears to be a primitive disk operating system for Intel 8080-based microcomputers. It is suitable for business and scientific applications or the hobbyist, the vendor said.

The sector-based disk operating system, which works with the Icom Corp. floppy disk controller, makes up to three memory buffer files available. It also includes six file manipulation commands plus SAVE, LOAD and two "special" integer functions said to be helpful in keeping track of files.

The language facilities in Disk Basic Etc, essentially a second-generation enhancement of a Tiny Basic, are largely extensions (through options) to commands already in place. For example, either a line number or executable statement may now follow THEN or ELSE.

The addition of ON . . . GOTO and EDIT statements, as well as the inclusion of 11 more functions and the improvement of the internal speed of some statements, also set this version apart from its predecessors, Binary said.

User I/O routines as well as stack and memory end values are specified in the user's manual, a spokesman added. Disk Basic Etc. uses the lower 12K bytes of memory plus 1K byte of scratchpad.

The software is supplied on either "minifloppy" or standard floppy disk and costs $50, which includes the user manual. The manual by itself is available for $10, according to sources at the Micro Store, 634 S. Central Expressway, Richardson, Texas 75080.

Network's 'Facts' Aid Retailer

WOODBURY, N.Y. – The Fast Access Computerized Transaction System (Facts) now installed as a remote-computing service of Calldata Systems, Inc. was described as a series of programs which provide a total management, accounting and control facility for retail stores.

Emphasizing that the system is intended for small businesses, a spokesman estimated retailers with gross sales as small as $250,000 could benefit from the service. It covers many application areas including inventory control, accounts payable and receivable, payroll and sales analysis, he noted.

The system, driven from a terminal at the retail store, can prepare merchandise orders ready for mailing and with complete accounting backup. It also maintains current inventories of merchandise and open orders, Calldata said.

Facts prepares accounts payable summaries and prints checks for vendors. On the other side of the ledger, Facts supports accounts receivables with credit authorization reports, exception reports of past-due accounts and 12-month summaries of each account, Calldata said.

The receivables support also includes preparation of customer statements on a variety of payment plans. Options include revolving accounts; 30-, 60- and 90-day "same as cash" accounts; budget accounts; and merchandise club billings, the spokesman explained.

Facts can also be used to prepare payrolls and print checks for and maintain tax status of all employees; analyze sales and inventory information on both unit and classification levels; and provide the user with on-line access to all records within the system, he said in summary.

Calldata Systems is at 20 Crossways Park North, Woodbury, N.Y. 11797.

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'Shortcut' Eases Record Choices, Cross-Tabulation

NEEDHAM, Mass. — Users at mid-size and larger IBM 360/370 sites have another file utility package to consider. Shortcut, implemented for DOS, OS or VS users, is now available from the DP Division of International Data Corp.

Among the capabilities supported by Shortcut are record selection, cross-tabulations and preparation of mailing labels. The package is oriented toward tape and other sequential data sets, but a "limited" indexed sequential facility is provided, the vendor said.

Functionally, Shortcut is a load-and-go processor driven by user instructions expressed in English-like terms. It is not a precompiler that requires several more operations before the program logic is executed, a spokesman stressed.

Cross-tabulations run by the software can be for up to 15 columns and a "virtually unlimited" number of rows, which can be defined dynamically. The cross-tab feature provides both column and row percentages for every cell, he added.

As many us four mailing labels can be printed across the page using the package's facilities. Input for the printouts can be printed "from almost any file" and controlled by the same record selection criteria available for all Shortcut operations.

Shortcut permits programming, but requires little of it for most of its work, the company said. It supports the IF statement to control branching and the DO command to effectively PERFORM routines.

While the software was developed for the IBM environment, it is being converted for use on other computers as well. Distributed in relocatable modules for DOS use, it requires about 90K of memory; load modules for OS users work in about the same space.

Shortcut is licensed for $295/mo for a minimum period of six months, payable in advance, the spokesman added from 152 Second Ave., Needham, Mass. 02194.

UCC Updates PDS Management System

DALLAS — Version 2.0 of the UCC Six partitioned data set (PDS) management system removes restrictions of earlier versions, including dependency on operating system features or specific access methods, according to the vendor, University Computing Co. (UCC).

The package inventories and controls PDS disk space. It recognizes expired or replaced members of a PDS and reallocates their space dynamically so data compressions (reorganizations) normally required with PDS are not needed with UCC Six, according to a spokesman.

The update supports the use of any utility that produces PDS output; many update functions can be performed without any utility beside the UCC package, he added.

The ability to update multiple PDS in one job step and to restart at any member of the set in case of failure is also part of the enhanced package.

The multiple updating is normally done in serial fashion, but may be done in a parallel operation through use of an option that allows concurrent users to work with the package, the spokesman said.

Password protection can be used in conjunction with the software to prevent unauthorized modifications to a PDS under UCC Six's control. The password for the data set and a lock code for the member are included in the JCL, avoiding unnecessary operator interventions, the company added.

All members of a UCC Six PDS can be retained for a user-selected period of time.

The package runs on IBM 360/370 equipment under OS or OS/VS. Written in Assembler, it costs $7,500, UCC said from 8303 Elmbrook (P.O. Box 47911), Dallas, Texas 75247.

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Geographic Spread No Problem For Design Team Using 'Cadem'

BURBANK, Calif. — Designers and engineers can work together on a development project even if they are located many miles apart with the facilities of the updated Computer-Graphics/Augmented Design and Manufacturing (Cadem) software now available from Lockheed-California Co., the company said.

Cadem supports CPU-to-CPU communications which allow all the users to look at the same picture from different locations in order to analyze preliminary drawings, detect errors without waiting for printed drawings and make necessary changes.

The changes can be entered through the use of electronic pens and keyboards at the remote terminal sites.

The modular software system, based on "simple descriptive geometry" and implemented on IBM 360/370 equipment, is accurate to six significant digits and capable of speeding a design process by more than five times, the company claimed.

Cadem can be installed in a service bureau environment and shared by a number of users, each with modest needs, for the system's capabilities, or in a user's in-house installation if the need for it is more substantial.

The package costs $225,000, the spokesman added from company headquarters at 2555 N. Hollywood Way, Burbank, Calif. 91520.

Calculators Slated As Magazine Theme

MENLO PARK, Calif. — *Calculators/Computers* will be a magazine "designed to fill the distinct void in the availability of practical computing materials written for educational purposes," according to the publisher, Dymax.

Plans call for articles on topics ranging from using basic, four-function hand-held calculators through using minis, microprocessors and time-sharing terminals. The magazine will also feature self-contained instructional units which can be directly copied and used for instructional purposes.

With an initial issue scheduled for May, the magazine will be published seven times a year for a subscription rate of $12.

The company has an introductory offer providing the first three issues for $4. Dymax can be reached through P.O. Box 310, Menlo Park, Calif. 94025.

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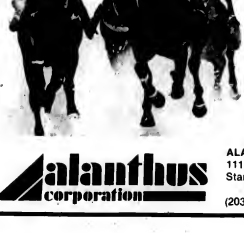

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Balancing Act

DEER PARK, N.Y. — Designed for mechanical engineers charged with maintenance of large equipment having rotating parts, a software package developed by Schenck Trebel Corp. for Texas Instruments' SR-52 programmable pocket calculator allows field balancing to be done on-site.

An adaptation of a program developed earlier for Hewlett-Packard's HP-65, the software is used with a portable field balancer or vibration analyzer to bring about the balancing with a minimum number of runs, time and expense, Schenck Trebel added.

The package includes programs for static, single-plane and dynamic, two-plane corrections and provides unbalanced reduction ratios of up to 20:1.

A set of magnetic cards, worksheets and instructions costs $99, the company said from 535 Acorn St., Deer Park, N.Y. 11729.

Better Than Benchmarks

Cautious Approach Works When Buying Car or DBMS

By Stephen L. Robinson
Special to Computerworld

A number of years ago I moved from the bowels of New York City to the bucolic countryside of Pennsylvania. The move necessitated my purchasing an automobile, something I did without – very nicely – in New York.

Never having purchased a car before, I adopted a set of procedures which are virtually identical to the ones I recommend to clients who are considering the acquisition of a data base management system (DBMS).

The steps are:

1.- Draw up a list of absolute "must haves" and "have nots." Use this list to narrow the field.

2. Construct a list of criteria which are of primary importance to your organization. (As will be evident, the absolute veto nature of your first list means that no criteria will appear in identical form on both lists).

This list should contain no more than 20 or so criteria; ideally, less than 10.

3. Assign weights reflective of relative importance to the criteria on the second list.

4. Obtain education (from vendors, other users, manuals, consultants) on each of the packages being considered. If you can, arrange a trial period through the package vendors or arrange to play with another company's copy of the package. (Do the latter clandestinely, or check with your legal department.)

5. For each of the criteria in (2), assess the value of the packages' facilities and how difficult it might be to enhance them.

Data Basics

The latter is of vital importance. For example, some packages do not directly provide facilities to maintain a physically sequential file, yet it is relatively simple to create and maintain such a file by "controlling" the file update activities.

6. "Multiply" the weights for each criterion by the values from (5) to derive scores for each of the candidate packages.

7. Discard packages that are obviously not competitive as indicated by (6). If more than one package remains, add one important criterion: Do the data base designers-to-be like the package?

8. Work out procurement plans (lease, buy, etc.).

We shall discuss, in turn, potential problems in each step.

1. Make sure this list includes absolute binary criteria. For example, must fit in 100K (but don't use this criterion if your hardware facilities are likely to be expanded); must interface with the XYZ teleprocessing (TP) package (but check if either the TP or DBMS vendor would develop an interface); must have an online query facility; must run under DOS, etc.

Avoid such meaningless criteria as "must support a hierarchical structure." Instead, move back one level and have a criterion such as, "must support our existing inventory system."

2. Ignore the trivial and absurd. Forget "must have read and write commands" – all the packages do. Do include such things if appropriate in your environment, as:

- Backup and recovery facilities.
- Sequential processing capability.
- Multiple key capability.

(Continued on Page 25)

Critic Came From Expert Group

By Stephen L. Robinson
Special to Computerworld

I'd like to comment on Paul Darlaston's critique [CW, March 14] of my article, "Benchmarking Used Incorrectly for DBMS Evaluation" [CW, Feb. 14].

Over the past several years I have met a number of people from Bell Canada at conferences and seminars. Assuming they are representative of the total staff, it is quite evident that Bell Canada has a level of technical expertise quite a bit above the industry norm.

The point of my warning was that it is wrong to let the vendors fine-tune a pilot system if you will not be able to maintain the same level of design proficiency. One cannot count on always having a vendor's top technical representative on call.

More frequently, one finds that after a sale has been made, the assigned account representative is not nearly as competent as the technical representative who participated in the sales and pilot project efforts.

I would estimate that less than 1% of the DP shops can match the top talent of a good software vendor. Certainly, if Bell Canada possesses such talent it is meaningful to allow the vendor to contribute its design efforts to the pilot project.

Except for an apparent disagreement over the level of vendor involvement (in the original article it was clearly stated, "Do let the vendor help you do the benchmark") and the validity of "single applications" as a benchmark, it would appear there is little disagreement between the two articles.

While I do not value the quantitative results of benchmarking as highly as Darlaston, I certainly value the qualitative aspects of the benchmark process. As discussed in the accompanying article on package selection, I feel it is indeed important to become quite familiar with the package and with a staff's ability to work with it.

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UK Study--Part 1

Distributive Data Bases Arrived Before DBMS

By Frank E. Taylor
Special to Computerworld

Distributed systems involved in the processing and storage of data at two or more sites are currently attracting considerable attention.

In many environments, such systems yield considerable advantages over centralized systems — particularly when on-line techniques are used — in terms of reduced data communications requirements, improved performance/cost ratios, an element of local user control and involvement and avoidance of some of the heavier penalties associated with multitasking, multiprogramming operating systems.

Much of the data in any local environment can be handled using conventional file-handling techniques, such as random (or direct) access or index sequential files. It can therefore be described as "distributed data"—and, in cases where considerable data volumes are handled, the geographically distributed files can collectively be termed a "distributive data base."

Such systems are distinguished from true data base management systems (DBMS) in that they can involve the storing of multiple copies of the same record at several locations within different geographically separated files.

Such distributed data bases *must* be distinguished from true DBMS which route all actions to one unit record (plus back up and recovery copies and temporary files within transactional logs), hence avoiding the classic problem of synchronizing updates encountered with multiple file copies.

Already With Us

Large distributed file-handling systems — distributed data bases in the broader sense defined above — are already with us. *Why Distributed Systems*, just published by the National Computing Centre, describes a survey of distributed systems within the UK and highlights some four case histories, all involving distributed files.

The first case entailed overnight linking of medium- to large-size mainframes carrying production information so critical production capacity loads or overloads can be reallocated on an "exception" basis within a large multinational company.

The second involved preparing clean valid data sets representing work completed (on a stage-by-stage basis) within a large construction company. The company's surveyors measure the work done outside normal hours, then use one of a series of on-line regional minicomputers with interactive terminals to enter and validate locally the data captured.

The valid data sets are then transferred, on demand, to a third-generation mainframe for input to a series of programs which invoice the customer.

The third system, operated by a food distribution company, handles local branch transactions such as order handling, dispatch note preparation and reconciliation and invoice preparation within local branches using a series of powerful minicomputers.

Only aggregated information such as total daily sales, is transferred on a "call" basis during the night to a remote mainframe.

In the return direction, data reflecting head-office decisions such as price changes is distributed to the branch systems to update their working files along with "topical" information such as company news.

The fourth system, operated by an

Services Expanding

PORTLAND, Ore. — U.S. Datacorp plans to expand the services it offers at data centers across the country to include page printing as well as support for computer output microfilm operations.

The first of the company's Honeywell Page Printing Systems will be installed in its San Francisco center, a spokesman added from 555 S.W. Oak St., Portland, Ore. 97208.

engineering company is based on a three-tier configuration. Intelligent terminals are used for local data validation from the lowest tier. These pass validated data sets to medium-power processors with large files

On the staff of the UK's National Computing Centre, Taylor and P.J. Dawn wrote the **Why Distributed Systems** *report. In the second part of this article, he will discuss problems of implementing distributive systems and possible solutions to those problems.*

for routine data processing, these being linked in turn to a top tier consisting of a single medium/large mainframe for processing of centralized administrative tasks and complex, specialized technical computations.

Hence distributed data bases, in terms of large interconnected files capable of interworking where necessary are already with us.

Distributed DBMS only recently became feasible as a consequence of the emergence of differing implementations of DBMS based on the same specification. Compatibility is clearly important if two remote physically separate DBMS are to be integrated to form one logical entity.

Presently, no clear-cut need exists for distributed DBMS since such systems are only justified (in terms of the routing software required to route all actions to the unique master record) when a very large number of accesses are made to a large data base on a random basis — in other words, when all active elements must be able to access all records.

If the association between data and process can be predetermined so only exceptional references are made to nonlinked entities, then today's technology and implementations based on file-handling techniques appear to satisfy most requirements. Distributed systems tend to be favored when processing problems can be subdivided in such a way that particular activities can be allocated to particular, geographically separate processing systems.

When the flexibility of a formal DBMS is required, for example, one may need to chain enquiries referenced in a flexible way. Then centralized rather than distributed systems tend to be presently considered.

Taking the argument further, the subdivision and distribution of a formal DBMS could generate a very considerable communications traffic. When a number of structure changes have to be transferred between the distributed locations in addition to the data itself, this could exceed the traffic generated within an alternative centralized system.

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Limited Vocabulary Keeps Writing Simple, Readable

NEW YORK – Companies wishing for simple, clear and concise technical manuals to support their products or internal projects may have an answer in the Basic 800 system from Smart Communications, Inc.

The system is based on an 800-word technical English vocabulary developed seven years ago by Caterpillar Tractor Co. The vocabulary is extended by a limited number of words peculiar to the industry for which the manuals are to be written, a spokesman explained.

The extended vocabulary for DP stretches to about 3,000 words, he said. Use of these words helps simplify and control the writing to produce manuals that are both easy to write and easy to understand, he added.

A four-step approach is used to implement the Basic 800 system at a user site. The implementation is done with the assistance and cooperation of the user's writers and technical staffs, Smart noted.

After a survey of the technical publications already in use at the client site, Smart goes through a linguistic analysis using a computer to determine the best vocabulary for the particular technology involved.

Creation of a corporate vocabulary – to meet the business needs of the user – is followed by writer training seminars. In these seminars, Smart's staff shows how to use the special vocabulary and be comfortable with its restrictions.

Tools provided include printouts of the vocabulary and a thesaurus facility, now in printed form but possibly available later as a program that can be installed on the user's computer for interactive searching.

To demonstrate the potential of the system, Smart will make a readability analysis of a company's manual, providing a printout showing level of readability and a list of words that are, according to the analysis, difficult to understand.

The company will also rewrite sample pages from the user's manual in the Basic 800 language "to prove ease of readability, adding our comments and ideas," the spokesman continued, noting this demonstration is available for $250.

Follow-on work with a client varies from job to job, he said, and might run from three days to more than six months. The cost typically ranges from $5,000 to $50,000, he added.

Smart is at 866 United Nations Plaza, P.O. 963, New York, N.Y. 10022.

Caution Urged in Picking DBMS

(Continued from Page 23)

- Query language facilities.
- Report writers.
- Reorganization facilities.
- Privacy/security mechanisms.
- Designer skill level.
- Programmer skill level.
- Transportability.
- Flexibility.
- Adaptability.
- Vendor support.
- Vendor history of enhancement.

3. Don't take this task too lightly. Minor differences here, when multiplied by the values in (5), can produce large savings in final totals.

4. This step is extremely important if the selection process is resolved by the suggested tiebreaker, that is, which package do the designers like?

5. This can be done internally, but should be checked by outside "experts." Alternatively, it can be done totally by outsiders.

In either case, try to ensure objectivity. Make sure the scorers are equally knowledgeable about all of the packages being considered. This is essential to the second part of the analysis, which requires consideration of how facilities can be added to those provided directly by the packages.

Try to have at least three scorers involved in this task.

6. No problems here. Straight arithmetic.

7. Anything less than a 10% difference should be interpreted as insignificant. Anything more than 20% is significant. In between, use your own judgment.

If there are two or more packages separated by an insignificant amount, let your prospective data base designers decide. They are the ones who will be primarily affected by the decision.

8. Work out your short- and long-range plans and act accordingly.

Extra Guidelines

Here are some additional guidelines to consider:

- If you are procuring a data base package for a single application, consider price. If you are developing a data base system, weigh its price fairly lightly. The differential development costs will, over a period of time, more than cover any price differential.
- Don't select a package until you have assessed your requirements. Weighting factors should be based on anticipated use, not present systems.
- Don't benchmark.
- Talk to present users of the packages you are considering (not just the ones the vendors tell you about). Attend user meetings.
- Expend the appropriate resources to do it right. You are not simply selecting a stand-alone software package, you are selecting a tool which may form the basis for a large percentage of your DP activity.

Switching data base packages in midstream is a lot more traumatic than simply putting in a new application package. Indeed, depending on how many applications have been developed at the time of transition, it can be an order of magnitude more difficult than a DOS to OS conversion.

- If in doubt, don't jump. Step back from the selection problem and attack it again.

For those curious about the tangential beginning to this article, the process does indeed work rather well for cars as well as data base packages. I have now had my car for 10 years and 150,000 miles, and I'm still happy with it.

Robinson is manager of data-base technology for CACI, Inc-Commercial in New York City.

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Ease of installation	14	7	0	0	3.7
Documentation	6	12	4	0	3.1
Vendor's technical support	16	6	0	0	3.7

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Flowcharts Almost Dead

Heirarchiccal Diagram Seen Better for Documentation

By Dennis Omlor
Special to Computerworld

The program flowchart is dead, at least for high-level languages such as PL/I, Algol, Cobol and others that have facilities for writing structured programs.

But planning and documentation are still important. Well-structured programs cannot be developed without a plan; maintenance workers cannot do their chores without documentation.

Concepts and Techniques

Since the flowchart hasn't lived up to its advocates' expectations, we must find a more useful alternative.

Many have said the hierarchical tree diagram is the tool to use for visualizing structured programs. I agree with that view, but only if the diagrams are used in an orderly way.

The diagram is very much like any organization chart. The basic purpose is shown at the top, with successively detailed purposes shown on lower and lower levels. There is no need to learn a series of symbols; only the box is used.

The user can presumably stop the downward branching at any point that seems definitive enough as a starting point for programming.

The other convention or standard holds that once programming is started, the boxes in the diagram are handled from the top down and, on any level on which there are multiple boxes, from left to right.

Following these conventions makes top-down development, testing and debugging natural outcomes of the creation of these diagrams. Even more to the point, perhaps, is that these diagrams take less time to prepare – or modify – than flowcharts.

That satisfies both the programmer's desire to write code quickly and management's desire to have a plan as part of the documentation, before programming gets under way.

Later in the program's life cycle, when changes are needed, the discipline imposed by the hierarchical tree diagram pays off again.

Using one of these diagrams as a start point, a maintenance programmer can see the overall structure of the program and obtain insights for subsequent module fixing.

If the original programmer followed good naming techniques and included appropriate cross-referencing of the source code to the diagram, the maintenance worker can go directly to the module that needs to be changed.

Multiple references to a module can be seen quickly. Useless reading of source code to find intermodule links – so often needed in tracing the logic of nonstructured but flowcharted programs – is sharply reduced or even eliminated with the hierarchical tree diagram.

It is important to realize that the flowchart and the hierarchical tree diagram are meant to serve the same function. With structured programs, however, a plan is necessary from the outset, whereas with a nonstructured approach, the "plan" can come after the fact.

The requirement for planning before programming is probably the principle reason why so many organizations have reported incredible productivity results with structured programming efforts.

Flowchart Future

All this sounds very negative. Is there a future for flowcharting? I believe so.

Flowcharts are implicitly GOTO-like, to utilizing this form of documentation goes hand in hand with coding that encourages logical branching.

In Fortran and other low-level languages, flowcharts are here forever because they reflect the way those languages serve their users.

In the classroom, flowcharts will continue to be useful in teaching the fundamentals of programming and machine concepts. I think they should be abandoned quickly, however, in a degree program.

Some have made the case for flowcharts at the very bottom level of a hierarchical diagram to closely define a module.

This might be all right if the module is kept short enough to fit on one page of printout. On the other hand, it obviously creates a likelihood of GOTOs within the module.

Should the module require more than minor changes later, a need for rethinking, restructuring and rewriting the module will develop.

Computers of the future will undoubtedly have more facilities to handle structuring of programs, thereby forcing the flowchart vs. hierarchical tree diagram question more than at present.

Computer manufacturers have been moving in that direction since the early 1960s.

Today, many machines have instructions, for example, that link mainline code and subroutines; others that translate whole series of data from one code to another; and still others which search entire tables with a single command.

Omlor is an assistant professor of computer and information sciences at Cleveland State University, Cleveland, Ohio.

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Concepts of TA Related to DP

SAN MATEO, Calif. — A 12-page monograph introducing transactional analysis (TA) as a method for improving communication is now available from Innovative Information Systems, which also plans a seminar late next month applying TA to the DP environment.

The monograph costs $1, but will be distributed free to those attending the seminar, now scheduled for April 29 at the Miyako Hotel in San Francisco.

The one-day session costs $95 and early registrations are encouraged, a spokesman noted.

The firm can be reached through P.O. Box 1081, San Mateo, Calif. 94403.

Interactive Cuts Price On Stock Valuations

NEW YORK – Interactive Data Services, Inc. has cut the cost of the listing it has compiled showing 1976 year-end mean price valuations of more than 31,000 stocks and bonds, government securities and municipal dollar bonds.

The valuations, required to calculate estate and gift taxes in compliance with the 1976 Tax Reform Act, are now available for $9.95 per copy or $3.95 each for 100 copies or more.

Greater discounts are available for larger orders and buyers may choose book form, microfiche or microfilm, a spokesman said from 22 Cortlandt St., New York, N.Y. 10007.

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User Proves It Can Be Done

Holding Company Develops Low-Cost Stock Quote Net

By John P. Hebert
Of the CW Staff

NEW YORK — If you ask Jeremy Connolly about the computerization of a competitive stock market, he'll tell you that skeptics told Weeden Holding Corp. it couldn't be developed cheaply enough.

But after building a working central market prototype — with computers, a data base, printers, remote intelligent terminals and digital communications — for $700,000, Connolly said it can be done — for about $10 million.

Securities dealers and brokers are presently using on-premise terminals to obtain best trade information for up to 300 securities under the system developed and maintained by Weeden here, Connolly said.

The Weeden Holding Automated Market (Wham) system primarily relies on AT&T Digital Dataphone Service (DDS).

It is viewed "as the first step toward a competitive market where people can see the pricing available for markets other than the New York or American Stock Exchanges," by Connolly, Weeden's systems vice-president.

'Third Market' Member

Weeden is part of what he called the "third market," comprised of people who set securities' prices as an alternative to the markets dominated by the large stock exchanges.

Because it is difficult now for people to have access to markets other than the New York Stock Exchange (NYSE), he said calls are usually routed to the NYSE where the orders are traded to the customer.

A "central market," however, is a place where all orders for stocks are brought from different places in the country and executed.

It brings all of the orders together, Connolly said, adding computers and terminals are the logical means to accomplish this task.

While a central location for information availability is a necessity for a working system, the access to that information to allow for order execution is just as critical, he explained.

To be able to do that with the smallest outlay of funds, Weeden needs terminals. "Telephones are inefficient and expensive" for the central market application, he said.

Moreover, the third market dealer needs intelligent terminals. "If we did not have intelligent terminals, we would have to make the system three times larger because of the enormous data traffic and resulting computer overhead," he continued.

Primary Goal

Weeden's primary goal was to verify that a central market exists and could be developed in a timely fashion.

Wham is presently handling about 50 Incoterm Corp. SPD 20/20 intelligent terminals in groups of eight to 10 at dealer sites in major cities.

It also handles about 20 Sycor, Inc. Model 350 terminals operating as stand-alone devices for brokers also in major cities served by DDS, Connolly said.

The system is able to handle about 1,500 trades each day in its present configuration, he said.

"By contrast, roughly 40,000 trades are made each day on the NYSE. Certainly, there are many political obstacles to a central market, but this model indicates there are few technical problems," Connolly said.

Wham is built around two Data General Corp. Eclipse S/200 computers, one of which serves as a backup processor. The system, he said, includes two dual-density disk drives and two tape drives per CPU and one 300 line/min printer.

"The system...can handle approximately 100,000 transactions in a six-hour day, including inquiries, market updates and trades," Connolly said.

"We expect that as the system develops, roughly 80% of that activity will come from the intelligent dealer terminals while the rest will come from broker's terminals."

And the different requirements of dealers and brokers was an important design consideration, he added. Brokers need terminals with inquiry capabilities and dealers mainly need inquiry capability.

These differences impacted both the design of the data base and the quest for terminals.

Problem Solved

On the CPU end, Weeden solved the problem by assigning the dealers' data base to core memory to be used for storage of dealers' current securities orders so transactions could be handled quickly.

At the terminal end, the Incoterm CRTs and controllers were chosen for dealers because they need to know about all the different changes with the maximum base of 20 to 30 securities they deal with, he explained.

"The dealers have to change with market changes and need a terminal which is more intelligent. Each dealer is able to hit three special function keys which allows rapid and efficient reaction to the changes with a minimum of CPU overhead without a time-consuming dialogue," Connolly said.

The CPU broadcasts the same messages to the 50 dealer terminals over six half-duplex DDS lines at 2,400 bit/sec in IBM Binary Synchronous Communications (BSC) protocol to the 3270-type terminals, he said.

Transmitted on each line is a single message to which the intelligent SPD 20/20 terminals can respond.

(Continued on Page 30)

Enhances Data Entry System

IBM Adapts 3760 For Payments Processing

By John P. Hebert
Of the CW Staff

WHITE PLAINS, N.Y. — IBM has developed an adaptation of its 3760 key entry terminal system to process customer payments at business user sites.

The 3762/3790 Remittance Processing System also doubles as a stand-alone data entry system, IBM said.

IBM also enhanced the 3760 data entry system to include remote user programming, increased communications speed and host CPU attachment capabilities, in addition to introducing a single-station 3760 terminal.

The dual-station 3762 can reconcile, inscribe, endorse, batch and code up to 1,400 bills or checks per hour in a single operation to ready them for deposit to a bank account, according to an IBM spokesman.

Each 3762 consists of two gas panel displays with 240 char. per display, 11 status indicators and a 66-char. alphanumeric keyboard available in four versions, including Ebcdic and Ascii codes.

It also includes an intelligent 3791 communications controller, scanners, audit trail printers and built-in stackers, the spokesman noted.

The scanner can read OCR-A numeric font and can optionally read OCR-B, 1403 Standard .095 and 1428 fonts, IBM stated.

Up to eight of the dual station units can be attached to a single Model 3791 controller with 5M- to 30M bytes of disk storage and a diskette for program loading and I/O functions, he said.

Intermixed Terminals

Both 3762 and 3760 terminals may be intermixed on the same controller, he added.

The 3762 terminal keyboards have an automatic locking feature to signal operators that bill and check amounts do not match. The operator must reconcile the discrepancy before the transaction can continue.

The 3762 stations endorse the checks, print audit trail data on both documents, send them to separate stackers and print journal tape. Deposit slips are printed for the check stacks, the spokesman noted.

The 3762 stations can transmit records of the transactions written on the 3791 disk file to a host 370 CPU or retained in the diskette storage for later processing.

IBM 3762 Design Model

The remittance processing system can also transmit the information from a remote location to a host 370 CPU at 4,800 bit/sec under IBM's Synchronous Data Link Control (SDLC). No other line disciplines are

(Continued on Page 29)

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Tran Adds Mini-Based Circuit Switch Designed for Start-Up Digital Net

EL SEGUNDO, Calif. — Computer Transmission Corp. (Tran) has introduced a minicomputer-based circuit switch designed to allow large start-up networks to handle both synchronous and asynchronous digital data.

The M3201A-2 supports a time-division multiplexed (TDM) network with central CPUs, to provide central control and structure a network that can be expanded, according to the firm.

The switch can accommodate communications from a mix of synchronous and asynchronous terminal clusters to the CPUs from 64 kbit/sec trunk lines, when used in conjunction with Tran M3212-1 TDMs.

Users can add switching to their existing networks without changing terminals or software because the switch is transparent to both synchronous and asynchronous protocols, according to a spokesman.

Features of the M3201A-2 include port contention and automatic speed recognition (Autobaud), in addition to the capability to reconfigure a network through the device by reprogramming the microprocessors in the switch multiplexers for new channel assignments, he said.

Diagnostic Technique

The switch also features a centralized diagnostic technique to facilitate network maintenance, partitioning and abbreviated addressing, he added.

It monitors, disconnects and connects, recording the elapsed time on all network calls.

The single switch system utilizes a Computer Automation, Inc. Naked Mini LSI-II CPU with 64K of 16-bit core memory.

Microprocessor modules are used for routine data transfer and control functions to enhance throughput capabilities, Tran said.

It can handle a maximum of 32 high-speed trunks with data rates to 64 kbit/sec. Trunk interfaces include RS-232C; CCITT V.24 and V.35; and Bell 301/303-type, the company added.

The switch system can support up to 2,048 low-speed channels, the spokesman claimed, adding the asynchronous rates range from 110- to 9,600 bit/sec, while synchronous rates range from 1,200- to 19,200 bit/sec, he said.

Synchronous terminals enter the network through the Tran M671 remote terminal interface unit, which permits transparent handling of protocols by providing a common interface through a 12-key touch pad, the company said.

A basic M3201A-2 Data Switch system includes the switch with 64K of memory, one management console, a floppy disk for program load and a floppy disk controller, in addition to a rack alarm module, a basic switch software module, cabinet and power supplies, Tran stated.

The basic switch system costs $80,000 and does not include the M3212-1 TDMs, the spokesman noted.

Users can upgrade the switch to become part of a Tran Pacuit packet/circuit switched multinode network for about $12,000, he added.

The upgrade can be made from a kit which includes microprocessor modules, a software package and the appropriate trunk interface module, he explained.

The switch has a delivery schedule of five months, the company said from 2352 Utah Ave., El Segundo, Calif. 90245.

Test Set Goes Portable

ALEXANDRIA, Va. — Dynatech Laboratories, Inc. has introduced a portable version of its TC-100 data test set.

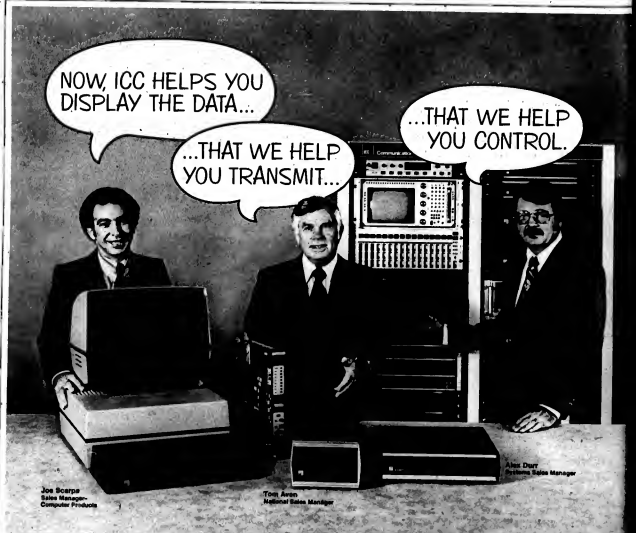
The TC-100P can simulate and test all components of the data network including communication circuits, modems, terminals, computer ports and communications software, Dynatech claimed.

It includes an EIA breakout panel with LED indicators and uses an Intel Corp. 8080 microprocessor, a spokesman noted.

The TC-100P can be used as a data trap for on-line interactive monitoring, as a pseudorandom sequence generator for bit-error rate testing or as a binary sequence generator to test terminals.

It can interface synchronous or asynchronous communications lines, carrying data at speeds of 19.2 kbit/sec and 9,600 bit/sec, respectively, he added.

The unit costs $3,600 from Dynatech at 900 Slaters Lane, Alexandria, Va. 22314.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MIT Develops Blind Person's Alternative to a CRT

CAMBRIDGE, Mass. — A blind person's alternative to a CRT terminal has been developed at the Massachusetts Institute of Technology's (MIT) Sensory Aids Evaluation and Development Center.

The device provides information in Braille through a set of solenoid-operated pins that the blind computer operator reads by feeling.

Dr. Derek Rowell, director of the Sensory Aids Center, said the Braille display is expected to expand job opportunities for the blind.

The initial job application is at Southwestern Bell Telephone Co. in Little Rock, Ark., where a blind person is being trained to use the Traffic Service Position System (TSPS) through which most operator-assisted calls are handled.

The Rehabilitation Services Administration of the Department of Health, Education and Welfare has estimated that 200 to 300 blind people could be employed nationally as TSPS phone operators, according to Rowell, an assistant professor of mechanical engineering.

Grants from the Rehabilitation Services Administration and the E. Matilda Ziegler Foundation supported the work that led to the development of the Braille device.

TSPS operators use a computer-operated console with approximately 90 lamps and push buttons that indicate the nature and status of the calls they are handling.

The primary obstacle facing the blind is their inability to read the console in order to determine what action to take.

"What we have done," Rowell said, "is to carefully analyze the sequence and hierarchy of operations of the TSPS console and to define a set of discrete messages that will alert the operator to any change in the status of the console.

"The messages are then encoded as a 12-char. Braille message that is presented to the blind operator through a set of solenoid-operated pins," he explained.

The device uses a microcomputer to scan continuously the lines of the conventional TSPS display and to encode the message.

"We expect the blind operator to act as efficiently as a sighted counterpart," Rowell said.

The device can make it possible for blind people to work as computer programmers, reservation clerks, inventory clerks and taxpayer service representatives, according to George Dalrymple, the engineer at MIT's Aids Center who developed the Braille display.

"In short," he said, "any job that enters, manipulates or retrieves data or programs stored in a remote computer could be filled by a blind person if he is provided with a terminal using a Braille display."

The display reportedly is an outgrowth of the center's long interest in vocational rehabilitation of the handicapped. The concept grew from earlier work done at the center under the general supervision of Prof. Robert W. Mann.

That work led to the Braillemboss — developed during the 1960s as the first computer terminal for the blind — which produces embossed Braille on a page format from any standard communication link.

Together with a specialized computer program, Dotsys, this device provided the first English text to Braille conversion by computer. More than 15 Braillembosses are in use, according to MIT.

"We are happy to say that a company siezed upon the concept and is now manufacturing faster and improved versions," Rowell noted.

From this experience, the MIT engineers realized that "handcopy" Braille was not always necessary and, in many cases, was undesirable. The result was a program to develop a refreshable display with "pop-up" pins to communicate a single line of text, as a possible blind person's alternative to the ubiquitous CRT terminal.

Firm Develops Low-Cost Stock Quote Net

(Continued from Page 27)

Rather than a 2-1/2-sec to 3-sec response time on the 2,400 bit/sec lines, the response is about 1/10 of a second for a 40-char. transmission, Connolly claimed.

"As price changes on securities in the system are received at Weeden, updating messages will be sent from the CPU to each intelligent dealer terminal cluster controller, Connolly said.

"Stored with each controller is a list of all of the securities of interest to dealers at each of the terminals the controller handles. The controllers will sort the updating messages and pass them to the appropriate terminals, where the message will appear on the display screen.

"As dealers at those terminals receive updating messages, they will want to be able to change their order posture quickly.

"Our system allows them to do that through a shorthand code. For example, a dealer can change a price on a current order with only three keystrokes," Connolly explained.

'Market-Minding' Application

This "market-minding" application is the heaviest system load, he said, adding the clusters are limited to eight to 10 terminals because of the necessity of line diagnostics to avoid problems of downtime.

The Incoterm units need only four keystrokes to define the screen cursor position. In addition, he said, a single keystroke is able to edit pricing information appearing on the CRT, increasing or decreasing a bid by an eighth of a point.

Four such terminal systems have been installed in regional exchanges and dealer firms which compete with Weeden, he said.

Although Sycor did not have a user-programmable clustered terminal when Weeden was searching for the dealer application devices, Weeden chose its stand-alone Model 350 for the broker application.

It was the best and least expensive general-purpose terminal available, he recalled.

The brokers receive and transmit trading information from these IBM 3270-compatible terminals through the half-duplex digital lines at 2,400 bit/sec in BSC protocol, Connolly said.

Since implementation began, Weeden has signed more than 200 brokers as customers. These brokers represent a new market for Weeden, which formerly dealt only with institutions.

All-Digital Communications

To avoid finger-pointing situations between vendors, Weeden chose AT&T for all of its communications lines and data set needs.

These dedicated DDS lines are far more reliable than their analog counterparts, Connolly said, pointing out that when there is a line problem, the Bell maintenance people have more difficulty locating and correcting it.

The only Wham terminals using analog lines and standard modems are located in Cincinnati. All of the other terminals and clusters work through Bell Digital Data Sets, he noted.

Wham was operational last September, but Weeden's work on the system began more than a year earlier, Connolly said.

Now the system is in the heavy volume period, although the network cost is only a small fraction of the total system cost — about 10% to 15%, or about $5,000 to $6,000 per month, he estimated.

Connolly said Weeden chose DG to supply hardware for the system partly because of the foreground/background capability of DG's RDOS, a real-time disk-based operating system.

"Our communications-oriented functions, such as queueing and message dissemination, are handled in the foreground, while orders, executions, inquiries, responses and other data base-related functions run in the background," he said.

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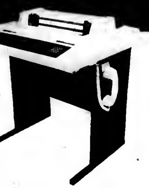

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CDI Extends Miniterm Line With Micro-Based ASR

BURLINGTON, Mass. — Computer Devices, Inc. (CDI) has added a dual microprocessor-based thermal printing terminal with off-line editing, storage capabilities and optional APL operation to its Miniterm product line.

CDI's portable Miniterm 1204 automatic send/receive (ASR) has a standard 8K (8-bit char.) random-access memory (RAM) and built-in minicassette drive allowing storage up to 68,000 char., according to a spokesman.

About 7K of the total RAM is available for off-line data entry and high-speed search and edit, with 1K devoted to terminal control functions, he said.

Optional RAM can expand the volatile storage to 31,000 char., the spokesman added.

Digital minicassettes can store up to 34,000 char. per side with 83-char. block recording and off-line block and character editing capabilities.

Serial asynchronous data is transmitted from the terminal at switch-selectable speeds of 110-, 300- or 1,200 bit/sec from tape, memory or keyboard to the line, according to the firm.

Local and half- or full-duplex modes are also selectable, CDI stated.

The Model 1204 ASR includes a switch-selectable three-mode keyboard with 96 upper- and lower-case characters and underscore; a 16-key numeric pad; and multifunction keys, CDI said.

Its thermal print mechanism operates at 35 char./sec in conjunction with a 1,000-char. line buffer to print 5 by 7 dot matrix characters, the spokesman noted.

Other features include selectable Ascii or binary code operation and selectable parity, in addition to a 10-char. horizontal or vertical tabbing capability and RS-232C interface, he added.

The terminal can be used in programming, data entry/inquiry or data base interaction applications and other remote batch processing tasks, the company said.

Optional features and equipment include a 20mA current loop interface, answer-back memory, user-defined keyboard encoding and carrying case.

The optional APL feature costs $250, the spokesman noted.

The 20-lb 1204 is priced at $165/mo on a one-year lease and costs $3,385 to purchase.

The company is located at 25 North Ave., P.O. Box 421, Burlington, Mass. 01803.

IBM Adds Remittance Terminal, Enhances Data Entry System

(Continued from Page 27)

available for communications from a remote site, he added.

In addition to the accounting functions, the 3762 can double as a routine full-time data entry station. Payment processing and other data entry jobs can also be intermixed on the dual-station terminal, the spokesman added.

A representative 3762 terminal system consisting of four dual-station 3762s and a 3791 Model 1B controller with 10M bytes of disk cost $8,288/mo under IBM's Extended Term Plan (ETP), $9,639/mo under a standard rental agreement, and $338,000 to purchase.

The minimum configuration with a dual-station 3762, a 3791 Model 1B with 10M bytes of disk and local channel attachments costs $3,044/mo under the ETP, he said.

The IBM 3760 Model 3 terminal deviates from the two previous dual-station models in the 3760 lineup.

Terminal Transactions

It is a single-station terminal that can be used as a supervisory, correction or key entry station and has an optional switch feature allowing the unit to be attached to as many as four 3791 controllers, the spokesman noted.

IBM 3760 data entry system users can upgrade their systems' communications capabilities from 1,200- to 4,800 bit/sec under SDLC at no charge as part of the enhancements introduced recently, the spokesman noted.

In addition, 3760 users are now able to attach their systems to 370/115-0 CPUs operating under IBM's DOS/VS/Virtual Telecommunications Access Method (Vtam).

They can also attach the systems to all four models of the IBM 3791 communications controller, allowing up to 30M bytes of disk storage.

Data entry formats of the system have been increased from 10 to 20 per key entry job and from a previous limit of 750 for the system to 2,500 formats, the spokesman noted.

A local programming capability gives remote users the ability to write, check and edit routines independent of the host CPU without interrupting data entry jobs, he said.

Printing capabilities have been increased to 410 line/min. The system has been upgraded to selectively print batches by name, number or conditions or to print records in a batch, he said.

Channel Support

Local channel-attached 3760/3790 systems are supported by IBM's Batch Transfer Program (BTP) interface between Vtam and the host. BTP, he said, operates under DOS/VS, OS/VS1, OS/VS2 Single Virtual Storage (SVS) or Multiple Virtual Storage (OS/VS2 MVS).

Remote attachments are supported by Vtam under the Network Control Program (NCP), BTP, and DOS/VS1, OS/VS2 SVS or OS/VS2 MVS, he added.

The 3760 Model 3 rents for $160/mo on the ETP, a two-year agreement; for $188/mo on a standard rental; and can be bought for $6,770, he said.

Model 3 shipments will begin in May. The printing enhancements and additional format capabilities will be available in March 1978, while the ability to attach to the 370/115-0 and increased communications speeds are available now.

IBM can be reached at 1133 Westchester Ave., White Plains, N.Y. 10604.

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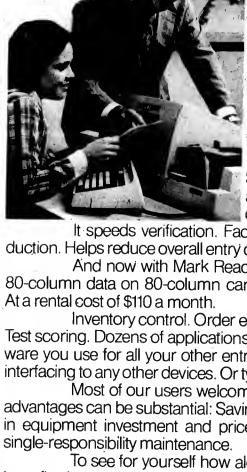

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Saves Time, Reduces Errors

Clustered System, COM Ease Firm's Search for Titles

CHICAGO — Chicago Title Insurance Co. (CTI) has designed a terminal system that saves time and reduces errors while maintaining a title plant — a massive volume of information about the ownership of property in a specific geographic area.

When someone buys a house or other property, the seller is required to show the buyer clear title to that property. To assure clear title exists, the seller turns to a title company.

CTI uses a Sycor, Inc. Model 440 clustered terminal processing system to maintain and search its title plant. Once the company has checked its title plant and is sure a property is clear of liens and encumbrances, it issues a certificate of title to the seller which in turn is presented to the buyer.

CTI or its agents serve more than 2,000 counties and the company maintains 36 title plants with automated equipment. In other areas, independent agents share title plants with other firms or title plants are kept by hand.

Jim Millington and John Stilla, systems officers, talked about Opticom I and II, the

Terminal Transactions

systems their people developed for building and maintaining title plants on computer output microfilm COM and the Model 440s respectively.

"Opticom I makes use of optical scanning forms where data is typed into fields on the sheets," Stilla explained. "These forms are collected for six to eight weeks, shipped to Chicago for scanning and initiation of master file updating on CTI's IBM 370/158 and eventually COM is produced.

"Microfiche or rolls of microfilm provide a complete index to a county's recording affecting property ownership. Its drawback, in certain cases, is the hand sorting and filing into the 'pre-Opticom' file of scanning documents," he said. "This allows for mis-filings, lost documents and other common problems inherent in a filing system. It is not difficult to understand when two months' volume might represent 25,000 or more documents," Stilla said.

"This paper system is fine for low-volume users like Vilas County [Eagle River, Wis.] with 50 to 100 title-affecting recordings per day, but too small for larger counties...with 600 to 1,000 title actions each day," he noted.

"This terminal COM system provides data collection, editing, verification, sorting, and security as well as immediate response on property and name searching and it is the only mini-based system that can offer all these features," according to Millington, who is project manager.

"We feel that productivity will increase one-third to one-half while costs remain the same to our users because of Sycor's pricing and elimination of optical scanning, typewriters, special forms and paper handling," he said.

"Today information about a specific piece of property such as liens and ownership changes and about individuals such as judgments and divorce actions are stored on a 10M-byte disk at our users title office.

"Data is entered on terminal display stations by an operator with eight special formats that cover each type of action about a piece of real property. With the terminal controlling formats and guiding the operation, errors in data are reduced and almost eliminated," Millington said.

Transmissions to Chicago

Each day's activities for a county are transmitted to Chicago, where information is used to update the master file. The updates, with fully unique keys, are returned to the branch office or agent for addition to their title plant search files. The full master file in Chicago is maintained on the 370/158 CPU at company headquarters here.

The 440 lets the CTI branch or agent search against more than 30,000 current records for a specific county. Searches are run against the property and against the owners' names.

Opticom II lets operators inquire by entering a property identifier and the surname of the parties. The Opticom II system on the terminal has been programmed with an automatic sound-alike search: for example, if "Long" is entered, it will also check for "Laung" or "Lang" in case there is an error in the spelling of the name of the person applying for title insurance.

"Since we are looking for matches or 'hits,' if nothing shows up against the property or name we can be sure the property is clear," Stilla said.

If the search results in some 'hits,' the 440 displays each one with an option to print, and we issue the title noting the exceptions that the seller must take action to correct or the buyer accepts title with outstanding objections," he explained.

Labor Cost Savings

According to Millington, "It will take less experienced personnel to handle the searching and maintenance of the title plants and that means a saving in labor costs to our agents and offices."

CTI looked at some other systems for maintaining title plants before developing its own on the 440. "One system ran on an IBM System 32 and used 400 diskettes to maintain a master file," Millington recalled.

At the end of the day, they would get a list of the diskettes to check for references to the property in question.

"The listed diskettes were then batched against one empty diskette for the final review. This represents a batch method which is slow and with no immediate response that appears to cost more than our Opticom II does," he said.

CTI has 120 offices and more than 1,400 agents throughout the U.S. A joint effort comprised of four title companies in Columbus, Ohio, and CTI offices in Memphis, Tenn., and Seattle, Wash., have already been converted to Opticom II and terminal systems and five more offices are scheduled to be converted soon.

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GE Has MFP

WAYNESBORO, Va. — General Electric Co. (GE) has introduced the Terminet Multiform Printer (MFP) which reportedly is capable of producing nine-part forms at 30 char./sec.

Priced at $1,675 in a send/receive version, the MFP is also available in a single cassette magnetic tape configuration for $3,220 from GE's Data Communications Products Department, A&SP, Waynesboro, Va. 22980.

ACS Unit Makes 'Dumb' Devices Intelligent

SUNNYVALE, Calif. — Users of hard-copy or CRT terminals can reportedly upgrade them to perform as intelligent devices with the addition of the Basic Intelligence Unit (BIU) from Applied Computer Systems (ACS).

The BIU is said to offer multiterminal connection capability with user-oriented programming packages and expandable disk, read-only memory and random-access memory.

The unit does not affect normal operating procedures or standard communications interfacing and comes with the ACS editor, lister and disk operating system software, according to the firm.

The device plugs into terminals at the local terminal site through an RS-232 interface, a spokesman noted.

Multichannel communications rates are independently programmable from 110- to 9,600 bit/sec, he added.

The basic BIU configuration includes a 16K memory, two diskette drives, four I/O ports and the three software programs. The memory is field-expandable to 64K and up to six IBM-compatible diskette drives can be used to store more than three million words, ACS said.

The basic system costs $5,000, the vendor said from 615 N. Mary Ave., Sunnyvale, Calif. 94086.

Informer Adds P300 Portable CRT

LOS ANGELES — Informer, Inc. has introduced a portable CRT/keyboard terminal with an RS-232 interface to access a host CPU from local or remote locations.

The Model P300 was designed for carrying and setup in the field and contains a 5-1/2-in. CRT screen and control electronics in its primary cabinet. A fold-out keyboard is connected by flat cabling, according to a spokesman.

Keyboards can be configured with standard alphanumeric keys only or with an optional numeric pad and function keys. The control electronics can be configured in the character-interactive mode, in a polled-block mode or for use under microprocessor control, he added.

Terminal Transactions

Built-in modems can double as acoustic couplers, hard-wired directly to the CPU or connected to high-speed modems via the RS-232C interface, the company said.

Accessories for the P300 include printers; off-line storage on built-in cassette tape drives or floppy disk units; and a composite video output for driving large screen monitors, according to the spokesman.

The terminal is priced at $2,080, he said from 8332 Osage Ave., Los Angeles, Calif. 90045.

Converter From WTI Allows 1,200 Bit/Sec

COSTA MESA, Calif. — A transmission speed converter from Western Telematic, Inc. (WTI) reportedly allows any 10- or 30 char./sec RS-232-compatible terminal with storage to communicate at 1,200 bit/sec.

Data can be recorded off-line at the lower Ascii terminal rate, then sent to a host CPU at 1,200 bit/sec through the WTI BRC 1200 and a 1,200 bit/sec full-duplex modem, WTI stated.

Receiving Buffer

A 256-character receiving buffer permits sign-on messages and protocol verification between the host and the terminal, WTI added.

Switches on the BRC 1200 are said to allow the user to bypass the converter, inhibit data to the printer and select transmission rates.

The buffer control allows the slow-speed terminal to sample 256 character blocks of the incoming data to ensure the data is being received, WTI noted.

The BRC 1200 costs $399, according to the company at 3001 Red Hill Ave., Costa Mesa, Calif. 92626.

You're outgrowing your 3270. Now what?

Things really bloomed when you first put your 3270 on line.

But now your system's growing like a jungle.

Your phone lines or your mainframe go down...so your 3270 just sits idle.

And when everything is working, your lines jam up and your mainframe bogs down...so your 3270 works a lot more slowly than you'd expect.

Errors keep cropping up, but your 3270 can't weed them out.

And you'd like to keep a small data base at your terminal...but your 3270 can't handle that.

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The Harris 8170 is completely compatible with the 3270. Emulates it 100%, without requiring debugging or new software. Costs less, too.

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The Missing Link

The HP 3000 Series II closes the gap between the small business system and the big central computer.

Until recently, that gap was a real problem. For small to medium-sized companies the cost of a big computer was prohibitive. But there was a growing need for extensive batch processing and real-time information management.

Today, the HP 3000 Series II fills that need. A fast, powerful general purpose system, it can handle a wide variety of computing modes at the same time. Yet system prices start as low as $110,000 (U.S. domestic price).

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The HP 3000 is fluent in COBOL, RPG, FORTRAN, BASIC, APL and SPL (our ALGOL-like Systems Programming Language). These are high-level languages, which the operating system treats alike. The same simple control language statements let you use any programming language.

Data Base Management: another "big computer" advantage.

IMAGE/3000, our DBM software package for this system, gives you the means to create and manage a data base. And our simple English-like inquiry language, QUERY, lets you access your data base easily.

You can compile reports, make casual inquiries without writing programs and update data on-line. You can generate forms, titles, page and column headings, data sorted by categories, subtotals, totals and averages.

IMAGE has proved to be such a useful DBM capability that it was named to the 1976 Datapro Software Honor Roll. This places it among the 38 top software products, and one of only three DBM packages, among 1447 rated by computer system users throughout the country.

The software was judged in six categories: ease of installation, throughput efficiency, vendor support, ease of use, documentation and overall satisfaction.

Turning raw numbers into usable information. *All the tools for data base management are provided by our IMAGE/3000 software package and English-like QUERY inquiry language.*

We've made our data management capability even more useful with the addition of KSAM (Keyed Sequential Access Method), giving you fast access to indexed sequential files.

Hardware advances add speed and reliability.

HP's "fault control memory" keeps the CPU running at full speed, even when a memory circuit has failed. Five error-correcting bits in every 21-bit word determine where a fault has occurred and the system compensates for it. A RAM automatically stores the information about the faulty chips. When our Customer Engineer arrives for regular maintenance, he calls up a status report and replaces any faulty circuits—even though everything has been running fine as far as you're concerned.

Fast (350 ns access) semiconductor memory is used, making the CPU easy to expand. In fact, you can go from 128K bytes of mainframe memory to 512K bytes, depending on the system you choose. And disc capacity ranges from 15 to 400 megabytes.

At the heart of the CPU is a microprogrammed 32-bit ROM-based processor. It contains 209 firmware instructions that execute many system operations normally left to software. This microprogramming speeds up such recurring operations as moving character strings from one location to another, scanning strings for a particular character and environment switching. Processing interrupts and linked list searches are also implemented in microcode, relieving the operating software of considerable overhead burden.

With its power and versatility, the HP 3000 is a natural upgrade for companies outgrowing their small business computers. If you'd like to see it in action, call your nearest Hewlett-Packard office listed in the White Pages. Or write to Bill Krause, Hewlett-Packard, 11000 Wolfe Road, Cupertino CA 95014.

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Handling big business problems on a small computer.

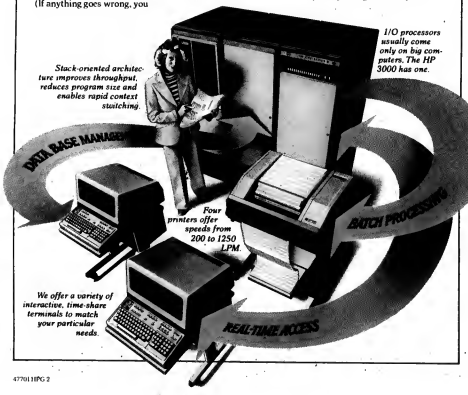
With a throughput two to six times greater than the original HP 3000, the Series II is designed to handle batch operations and multi-terminal on-line computation simultaneously.

All components of the system are supplied by Hewlett-Packard, which assures maximum compatibility and minimum service problems. (If anything goes wrong, you know precisely who to call!)

The smallest system, the Model 6, has a 128K main memory (expandable to 256K), plus a 50 megabyte moving-head disc, a 1600-bpi magnetic tape unit, an HP 2640B CRT terminal and a 16-port asynchronous terminal controller.

The Model 8 has all of this but starts at 320K bytes of main memory (expandable to 512K).

Any configuration can be enhanced with the addition of line printers, card readers and punches, terminals, discs, tapes and more main memory. Everything is planned to let your system grow with you.



Stack-oriented architecture improves throughput, reduces program size and enables rapid context switching.

I/O processors usually come only on big computers. The HP 3000 has one.

Four printers offer speeds from 200 to 1250 LPM.

We offer a variety of interactive, time-share terminals to match your particular needs.

4770 1 HPG 2

SYSTEMS&PERIPHERALS

Bits & Pieces

Tab Products Cuts Price Of Key-to-Diskette System

PALO ALTO, Calif. — Tab Products Co. has reduced the price of its dual-station key-to-diskette data entry system, the Model 702 [CW, Nov. 15].

A typically configured unit now costs $5,400 rather than $6,160 to purchase, the company said.

The price reduction was designed to maintain the 702's price advantage over the IBM 3742, according to a spokesman.

Equivalently configured, the Tab 702 is priced 7% to 22% less than the 3742 on lease or rental and up to 18% less than the 3742 on a purchase basis, he claimed.

ITC Develops Mini Version Of Verbatim Floppy Disk

SUNNYVALE, Calif. — Information Terminals Corp. (ITC) has announced production of a miniaturized Verbatim flexible disk, the MD 525.

The MD 525 is about one-half the size of the standard floppy disk and provides one-third the stored capacity. It can store the equivalent of 25 typed pages of data, but it is comparable to disk drive systems like those manufactured by Shugart Associates, a spokesman claimed.

The MD 525 costs $5.25 from ITC at 323 Soquel Way, Sunnyvale, Calif. 94086.

Dyma Has Line Protector

TAOS, N.M. — Dyma Engineering has an ac line surge protector designed to protect sensitive electronic equipment from line voltage surges, spikes and transients.

The unit contains a state-of-the-art suppressor coupled with a ferrite filter. The surge suppressor absorbs the energy from transients that exceed the protection level, a spokesman explained; the ferrite filter suppresses spikes and transients that fall below the level of the surge protector.

Power line hash, glitches and RF interference are reduced to a minimum, he claimed.

The unit, which plugs into a standard ac outlet, requires no tools or wiring, Dyma said. Models for 20A loads on 117 Vac branch circuits, two- or three-pin, cost $14.95.

Other ratings are available on special order from the firm at 213 Pueblo Del Sur, P.O. Box 1697, Taos, N.M. 87571.

Semiconductor Add-On

Intel Memory 'Rejuvenates' GE-400

SUNNYVALE, Calif. — Intel Memory Systems here has introduced an add-on semiconductor memory for the Honeywell/General Electric GE-400 computer.

Designated the Intel In-400, the system will rejuvenate the widely used GE-400, according to a spokesman for the firm. The In-400 provides higher throughput, reliability and maintainability at a fraction of the cost of the original GE-400 core memories, he claimed.

The In-400 contains a processor-transparent error detection, correction and logging subsystem. It can be installed in the processor to upgrade or replace the original core memories, the spokesman noted.

The In-400 stores 32K- to 128K words in 16K-word plug-in increments. It is available in both single-processor and dual-processor configurations; the dual-processor configuration allows two ports to cycle the memory simultaneously within different 16K boundaries, the company said.

Throughput Boost

The memory system offers a throughput increase of 10% to 15% through a combination of 500 nsec cycle time and as an asynchronous GE-400-compatible interface, according to the firm.

The error correction coding subsystem improves the mean time between failure by 10 to 25 times compared with conventional solid-state designs, the spokesman claimed. The subsystem automatically corrects single-bit errors and detects double-bit errors; double-bit errors can be processed as normal parity errors by the GE-400 processor, he added.

The error correction coding subsystem is supplemented by an error logger and display. The display identifies potentially failing random access memories, pinpointing error locations.

The subsystem is transparent to the processor and may be disabled so error correction will not interfere with other system testing, Intel said.

At full 128K capacity, the In-400 occupies three cubic feet, consumes 500 watts of power and weighs 100 pounds as opposed to the 200 cubic feet, 8 kilowatts and 2,600 pounds of core memory.

A 64K-word unit sells for $34,140 from Intel at 1302 N. Mathilda Ave., Sunnyvale, Calif. 94086.

Telefile Offers Extended Memory To Users of Univac 1100 Series

IRVINE, Calif. — Telefile Computer Products, Inc. has expanded its offerings of compatible core memory for Univac computers to include unitized extended memory for Univac 1110, 1100/20, 1100/40 and 1106 processors.

The Telefile Model T7013 unitized memory provides 128K words of storage. Data is stored as 40-bit words, each consisting of 36 data bits and four parity bits.

Memory cycle time is 750 nsec to match the existing Telefile T7005 memory and is adjustable to 1,500-, 1,000-, 875- and 800 nsec to match Univac memory speeds, according to a Telefile spokesman.

Plug Compatibility

The T7013 is plug-compatible with the Univac 7013 and 7033 unitized memories and is transparent to all programs written for the Univac processors, he said. No programming changes are required when Telefile units are added to the system, he added.

One or more Telefile memory units can be connected to a single Univac processor. The memories can be installed in separate cabinets or in multiple-width units.

Each T7013 storage unit contains a single replaceable high-density core module with all 128K words of memory. Two other plug-in modules carry the remaining interface and checking control circuitry. One- or two-way address interleaving is an optional feature, the spokesman noted.

The price for each 128K-word unit is $119,000 from Telefile at 17131 Daimler St., Irvine, Calif. 92714.

System Stints DP Center Access

SUNNYVALE, Calif. — A security system which controls access to data centers and other sensitive areas with the use of wallet-sized proximity cards has been introduced by Schlage Electronics.

All elements of the Model 114 are fully concealed to prevent tampering or exposure to weather, according to a spokesman.

The concept eliminates the problems inherent in card-insert systems: physical wear, card damage, environmental effects and vandalism, he added.

The system uses wallet-size command key cards to activate access doors when held within 4- to 6 in. of a concealed sensor. Cards may double as personal identification and will function either exposed or concealed, the firm said.

Sensors are flat, circular 6- or 8-in. disks, 1/8-in. thick, which mount in or on a wall or plate glass or encapsulated on exterior surfaces.

A single coaxial cable connects the sensor to the control unit up to 1,000 ft away. The system allows control of one access point and three code levels.

Options permit remote manual door control, alarm shunting, three time zone capability, variable door open time and standby power. Multiple door capability is available.

The Model 114 costs $422 from Schlage at 1135 E. Arques Ave., Sunnyvale, Calif. 94086.

The Source's Mouth

Source data entry — the many ways of capturing data at its source — will be the subject of a *Computerworld* special report in May.

The report will cover traditional keypunch, key-to-disk and key-to-tape methods as well as optical character recognition and terminal-based operations.

Readers are invited to contribute articles describing their experiences — good and bad — with this form of data collection. Thoughts on the state of the art, "where do we go next?" and "who should do what" are also welcome.

Contributions should be typed (double-spaced, please), limited to 1,200 words (four or five pages) and sent by April 15 to Frank Vaughan at *Computerworld*, 797 Washington St., Newton, Mass. 02160.

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SALES AND MAINTENANCE OFFICES THROUGHOUT THE US AND CANADA

Telefile RAD Substitutes Back Xerox Users

IRVINE, Calif. — Telefile Computer Products, Inc. has introduced a line of solid-state rapid access systems that reportedly enhance the performance of Xerox computers.

The Telefile T3250 systems serve as high-speed replacements for the rotating memory Xerox rapid access devices (RAD), the firm claimed. The systems provide scratch-pad, swap or working storage, it added.

Access time for the T3250 systems is midway between that of main memory and mass storage, according to a spokesman. Charge-coupled devices store data in 1K-byte sectors, and the maximum access time to any sector in the system is 256 microsec, he said, noting that data is transferred at rates up to 4M byte/sec.

Software Compatible

The systems are compatible with all Xerox system software based on the RAD accessory so no reprogramming is required, Telefile said.

Five models of the T3250 series are available with unit capacities ranging from 1M- to 5M bytes. Data is stored in a 72-bit parallel format consisting of two data words and an 8-bit error correction and detection byte.

Single-bid dynamic error correction is provided for each 64 data bits and cyclic redundancy checking is used to detect multiple bit failures within a sector, the spokesman said.

The T3250 system controller has a first-in first-out buffer that automatically adjusts the transfer rate to that of the data channel, Telefile said. Up to four Xerox processors can access the T3250 data base when the system is provided with an optional multiple-access capability, it added.

Each system is contained in a stand-alone cabinet with an automatically recharged battery to provide dc power backup in the event of ac power failure.

Prices for the T3250 systems range from $29,440 to $103,540, Telefile said from 17131 Daimler St., Irvine, Calif. 92714.

Fiche in Color

NEW YORK — Taylor-Merchant Corp. has begun producing color microfiche.

The cost of Kolorfiche in quantity, with approximately 80 color images, is 1/20 the cost of duplicating a similar quantity of slides; similar savings are achieved over color printing, a spokesman claimed.

Information and a brochure on Kolorfiche are available from the firm at 25 West 45th St., New York, N.Y. 10036

AM Fiche System Aids Retrieval

SCHAUMBURG, Ill. — The Bruning Viz A Fiche, an integrated system of microfiche panels, panel reinforcements, racks, holders, index tabs, albums and easel binders designed for microfiche storage and retrieval, is now available through local district offices of Addressograph-Multigraph Corp.'s (AM) Field Operations Division.

The panels were designed to accept standard 4- by 6-in. fiche and are available with 20, 30 or 40 pockets.

Prices range from $26 for a package of 10 standard 20-pocket holders to $43 for 10 of the 40-pocket reinforced panels. Quantity discounts are available, AM said from 1834 Walden Office Sq., Schaumburg, Ill. 60196.

Varian V77 Modules Give Custom Power

IRVINE, Calif. — Varian Data Machines has developed two modular power supplies to meet the customized needs of its V77 series computers.

One model provides a 100A logic power module and a memory power module to support up to 256K words of 660 nsec MOS memory. The other adds a module for data communications, accommodating up to 32 lines.

The basic unit costs $3,850 and the data communications module costs $4,150 from the firm at 2722 Michelson Drive, P.O. Box C-19504, Irvine, Calif. 92713.

Newsletter Reports Mapping Applications

SANTA CLARA, Calif. — A six-page applications newsletter presents seven case histories which document computerized mapping applications in urban planning, surveying, highway construction, oceanography and meteorology.

The newsletter, which focuses on the use of Versatec plotting equipment, is available from the firm at 2805 Bowers Ave., Santa Clara, Calif. 95051.

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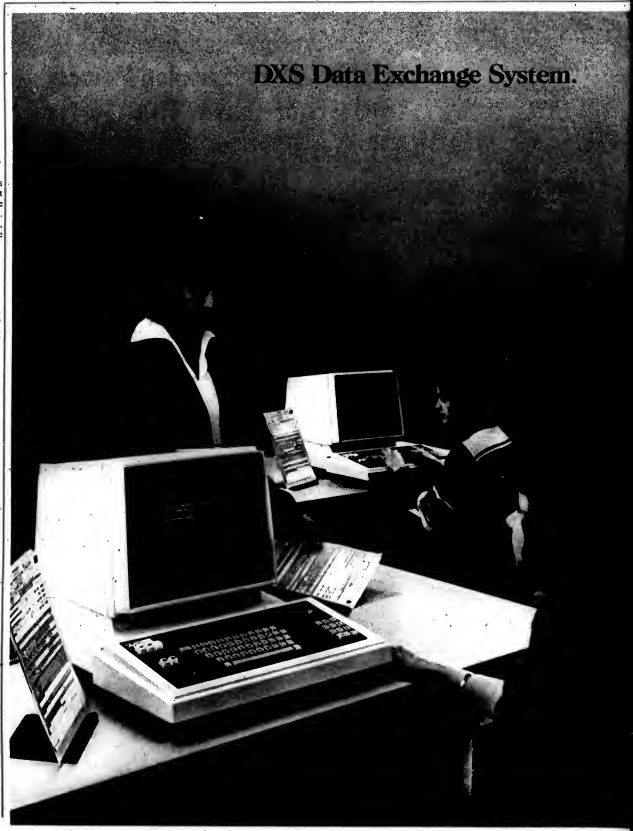

Key-to-Disk Cuts Service Bureau's Budget $600/Mo

WILKES-BARRE, Pa. — A large service bureau here "conservatively saves $600/mo in reduced costs and increased operator productivity" since it installed a key-to-disk system for data entry, according to Paul Gozick, president of Continental Data Processing.

About two years ago, Continental replaced 17 IBM 029 and 129 keypunch units and a Mohawk Data Sciences Corp. key-to-tape communications device with an eight-station Cummins-Allison Corp. 4400 system with IBM 2780 communications capability.

The system originally included a CPU with 64K bytes of memory, 5M bytes of disk storage capacity and a 100 char./sec line printer. Continental has since added six more CRT/keystations to handle an expanded workload.

Efficiency Mandatory

"As our workload increased and the cost of cards continued to climb, we realized we had to investigate more practical and efficient alternatives for data entry," Gozick said.

The first data entry job performed on the Cummins system was the keying of alien registration forms for the federal government. Continental was one of three firms involved in the keying, and "it was a very large contract for us and a very important one," Gozick said.

While the records were not very long, the job had a strict deadline. We completed keying 1.2 million forms in 2.5 months," he added.

One of the applications for which Continental uses the 2780 communications protocol is the processing of liquor stock replenishment orders.

Distribution Control

"In Pennsylvania, the state controls all liquor distribution through state-run stores. As stores request stock replenishment, these are approved by the liquor control board at the state capital," Gozick explained.

The data is transmitted by the state through its computer system to Continental where it is received on the 4400 system each evening.

Continental then produces shipping orders and warehouse picking slips for the regional liquor warehouses which ship to the stores in their areas. Further processing is then performed by Continental for the warehouses, keeping track of all receipts and shipments and the inventory of each product.

Faster Input

The operators at Continental average 10,000- to 12,000 keystroke/hour; with card punches, the average was in the 6,000- to 7,000 stroke/hour range, Gozick said.

In summarizing the savings Continental has experienced with the changeover, Gozick mentioned "lower cost of equipment, an increase in productivity of 15% to 30%, depending on the application, and the reduced mainframe time by inputting tape rather than thousands of cards."

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Source: 1976 Auerbach Computer Technology Report

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See the DXS Data Exchange System at the Computer Caravan and Interface 77 Shows.

Guardian Protects Sycor 400 Users

ANN ARBOR, Mich. — Sycor, Inc. is offering a field-installed option that reportedly protects Sycor 410 and 440 users from the potential problems of power blackouts or brownouts, memory hardware failures and CPU failures.

The "Guardian" option, which makes use of a battery pack attached to the back of the control unit, transfers the data in random-access memory (RAM) to the system's fixed disk in the event of a power failure and restores the contents to the RAM when power is restored, a spokesman explained.

Five-Second Reload

Upon system restart, the disk heads are reset and the memory reloaded within five seconds, he added.

A soft close feature continuously updates the disk directory pointers on spool files so a minimum number of records are lost on a machine failure, he noted.

With the Guardian option, the system may be restarted with the cursor on each of the system's CRTs returned to the last positions keyed prior to the disturbance, allowing the operators to continue entering data as if no disturbance had occurred, he claimed.

The option features up to 20 power fail cycles during a 24-hour period, automatic recharging during normal operations and maintenance of power at power shutdowns for five seconds, he said.

The option costs $62/mo on a one-year lease including maintenance. Purchase price is $2,200. Deliveries are expected in May from the firm at 100 Phoenix Drive, Ann Arbor, Mich. 48104.

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Speeds Order Processing

On-Line System Brings Better Customer Service

PRINCETON, Ind. — Better customer service, faster order processing, greater efficiency and increased accuracy are the results of installing an on-line order entry and inventory control system, according to the Potter and Brumfield division of AMF, Inc.

Marketing 1,500 standard, off-the-shelf relays through 260 authorized distributors in the U.S., Potter and Brumfield previously operated a card-oriented batch processing system for handling order entry and inventory control.

The decision to go to an on-line system was made by division management, who felt a better system was required to meet the needs of customers seeking shorter lead-times and faster deliveries.

"Our order entry system was designed specifically to meet these requirements in the most efficient manner," according to Richard C. Dixon, director of management systems and information. "This system was designed exclusively to enable us to provide optimum customer service."

Under the direction of Dixon, conceptual systems design began in 1974. The first step was to ask users in marketing, production planning and inventory control to "blue sky" an ideal system for providing the best possible customer service.

Detailed design work to meet the requirements of this ideal system were then initiated and final system design was approved in February 1976.

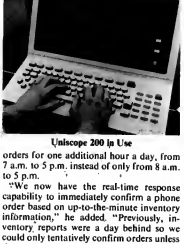
A Univac 90/30 system and IMS Associates, Inc. IMS/90 information management system were installed early last summer to provide the hardware and software capabilities to operate the order entry and inventory control system.

The 90/30 system, which includes 164K of main memory, four 8418 disk drives, two U-10 tape drives, a 500 line/min printer and a 500 card/min reader also provides potential backup for a Univac Spectra 70/45 batch processing system. The Spectra is currently being used for accounting and other applications, but eventually will be phased out and its applications will be incorporated on additional 90/30 equipment.

Several Improvements

The switchover to the system following installation, training and a one-week parallel run was accomplished last September with virtually no problems, according to Gordon Collins, distributor sales manager, who pointed out the system improved customer service in several ways.

"First of all, we now receive phone orders as late as 6 p.m. and still ship them the next day," Collins said. "Previously, our cut-off time was 2:30 p.m. In addition, we accept orders for one additional hour a day, from 7 a.m. to 5 p.m. instead of only from 8 a.m. to 5 p.m.



Uniscope 200 In Use

"We now have the real-time response capability to immediately confirm a phone order based on up-to-the-minute inventory information," he added. "Previously, inventory reports were a day behind so we could only tentatively confirm orders unless there was obviously ample stock in inventory.

"We also confidently tell distributors when a product can be shipped if it is out of stock, enabling him to immediately decide whether to place a back order," he explained. "In the past, we had to call the distributor back the next day to tell him an item would have to be back-ordered.

"Furthermore, the system enables us to instantly answer phone inquiries concerning orders in process, eliminating the need to leave the phone to check the files," he commented. "For example, if an order is not yet shipped, we can tell a distributor when it will be shipped.

"Or, if the order has been shipped but not yet received, we can tell him not only the method of shipment, but the number and weight of cartons, the bill of lading number and the name of the carrier."

The system has also improved order processing in terms of speed and efficiency, Collins said. "In addition, accuracy is better because pricing is handled automatically and other areas of potential error are eliminated through automated operations.

Faster Deliveries

"Overall, we now provide faster deliveries and instantaneous responses to phone orders and inquiries," he said. "At the same time, we can handle our growing volume more accurately and efficiently with fewer people.

"The end result is improved service to our distributors who, in turn, can then provide better service to their customers. Reaction of our distributors to the system has been excellent."

Potter and Brumfield receives 125 to 150 orders a day by phone, mail and TWX. The orders are processed by four sales coordinators, each of whom operates a Univac Uniscope 200 CRT terminal. A fifth CRT terminal is used in production planning to update production and inventory data.

A simplified alphamnemonic code is used to identify distributors when they phone in orders, eliminating the need to enter any information other than distributor name and location in CRT terminals to bring up complete distributor data.

Overall, the system maintains on-line master files for inventory; pricing; customers, including credit data; plant manufacturing orders, including production scheduling data; open orders; and closed orders.

The system also permits inquiry into pricing as well as all other files on an on-line basis.

"Our order entry and inventory control system provides the only way to handle growth in volume and still give customers good service," according to C. Nelson Hamill, vice-president of marketing. "The system is an extremely significant, long-term boon to Potter and Brumfield because it provides the company with the capability to improve customer service while containing costs not only now but — even more importantly — in the future."

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Varied Skills Seen Needed for Large-Scale Projects

By Frank Vaughan
Of the CW Staff

NAMUR, Belgium — Computer programming is not the only skill needed today to design and set in operation the large-scale information-processing systems that utilize the latest technology, according to James B. Bockian.

Other professional skills — ranging from telecommunications engineering to behavioral psychology — are also needed, he recently told the Eighth International Congress on Cybernetics in this Brussels suburb. Bockian is principal consultant for James B. Bockian and Associates of Fort Lee, N.J.

With the coming of age of the large-scale computer system, a planning effort of immense proportions is necessary; merely understanding the nature of systems development tasks and possessing a competent knowledge of the technology is no longer sufficient, Bockian contended.

Project management has the responsibility for the effective utilization and coordination of such skills and for human effort required to bring them to fruition, he added.

Bockian discussed five current methods used in managing the large-scale systems development project: project planning, multidisciplinary approach, user participation, teamwork concept and communication/project reports.

The Planning Imperative

"The planning function which precedes the beginning of a major systems development project must now assume new importance" because large systems now "have an impact that will be national and in certain cases international in scope and will require an investment in millions if not tens of millions of dollars," Bockian noted.

It is necessary to recognize that "the project to design and implement a complex computer system . . . is an undertaking with singular and unique characteristics involving advanced technology, creative solutions, several engineering disciplines, human psychology and administrative management. The effort to plan the systems development project takes the form of an exacting and precise exercise," he observed.

The particular knowledge and skills for the practice of project management in systems development are currently being identified as a unique professional area requiring definitive knowledge and special training and education, he added.

Multidisciplinary Approach

The definition, design and implementation of the telecommunications-oriented computer system now requires the active participation of consultants, telecommunications specialists and engineers, behavioral scientists, software specialists and data base designers in addition to the operating representatives of user departments, Bockian said.

A vital ingredient of project management is the planning and scheduling of services of experts and technicians, he said.

"The multidisciplinary approach to project management means that several major divisions of a computer organization will participate by assigning specialized personnel to the development project."

Personnel must be coordinated and scheduled so their participation is limited to specific, defined tasks and activities and so the specialists can be released to return to their original division when their tasks are completed, he suggested.

This approach can be described "as an evolving method of employing and coordinating the multiple skills and specialties demanded by the design and development of computer systems of increasing scope and complexity," he explained, adding "the fundamental assumption is the participation and support of numerous professional and technical specialties to realize the conception, design, development and implementation of the system."

There is an increasing appreciation of the developing role of operating personnel from the departments which will use the system upon its completion, Bockian noted.

One way of infusing administrative and productive expertise into the project staff is to appoint an executive director from the main user department and designate user representatives to work with the project staff in each phase of the project, he said.

The user representative should advise the systems personnel on the most practical and workable alternatives in finding the solution to a problem.

The project manager should report on the project's progress to both the user executive and the system director, he recommended.

The participation of user personnel as part of the project staff presumes a certain knowledge and sophistication of systems concepts and operations by the personnel, he cautioned.

But the participation provides not only a means of obtaining valuable information for the project staff, but also produces user personnel who are highly trained in the internal and external operation of the system, he added.

Teamwork Concept

The teamwork ethic implies an esprit de corps based on a mutual understanding that each member of the team is responsible for the success of the whole project, he said.

Factors bearing on the life cycle of the project include the recognition that the project cannot be undertaken without the participation and professional contributions of multiple disciplines and that the diverse disciplines must be so managed and coordinated that a productive and mutually satisfactory result is obtained, he said.

The teamwork concept is one of group effort. It is a situation in which the direction and objectives of the group take priority over those of the individual contributor, he explained.

Effective communication lies in the attitudes instilled by an atmosphere of free exchange of information between individuals and working groups and by the regular issuance of status reports and working papers, Bockian said.

Reports should contain the following elements: past week's accomplishments; major activities planned for the next week; past week's difficulties or obstacles and suggested solutions; interim findings or recommendations; and funds expenditures to date and for the past week.

Working papers should cover questions which are raised and for which there is no immediate solution, he said, noting a working paper should become part of the formal documentation and be made available to all project personnel.

Proper utilization of reports and working papers will, he suggested, stimulate a free flow of information and ideas.

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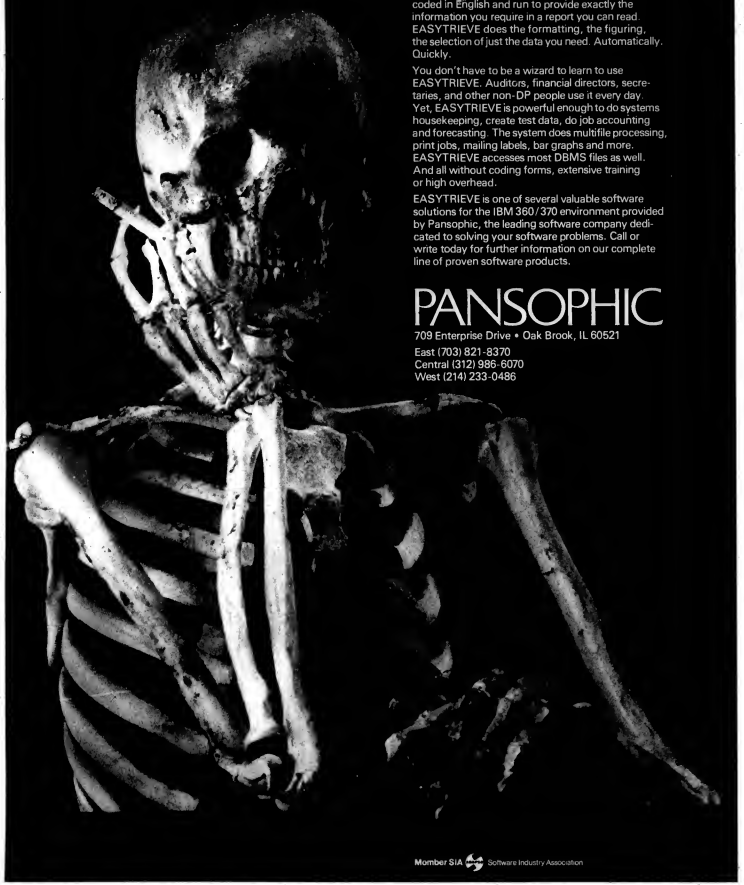

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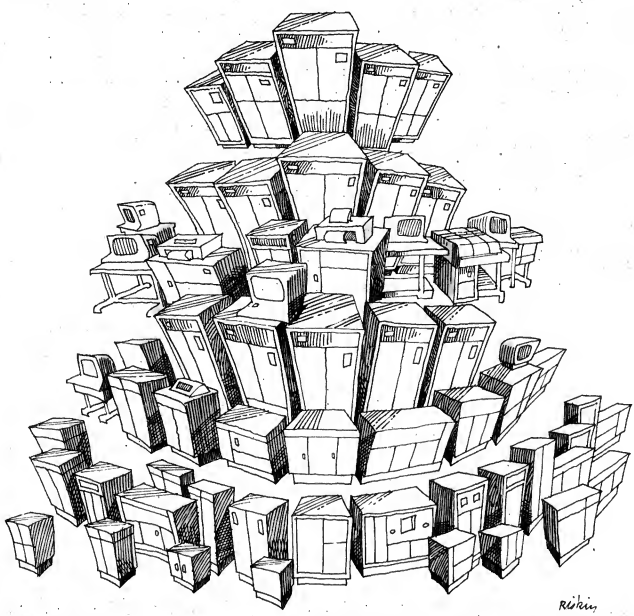
DISTRIBUTED PROCESSING:

A CONCEPT IN SEARCH OF A DEFINITION

A Computerworld Special Report
March 28, 1977



Because of Variety of Implementations

Distributed Processing Difficult to Strictly Define

By Stephen J. Callahan
Special to Computerworld

The recent proliferation of inexpensive, easy-to-operate computing devices, coupled with the continued advancement of communications technology, has focused an old subject — centralization vs. decentralization of computer resources. Only now it is called, among other things, distributed processing.

For the first time in the history of electronic data processing, many users can afford to tailor data processing functions to fit their corporate operating structures. Distributed computing returns the control over information back to where it was before there were computers: with the data users.

An all-purpose definition of distributed processing is not easy to state. Common to all definitions is the idea of sharing the processing load between two or more host computers or a host computer and several intelligent devices.

A stricter definition is not possible because of the many ways the concept of distributed processing is being implemented. For example, there are some installations that maintain tight control over the functions performed by each of the processors or intelligent devices. There are others that permit an ad hoc collection of sites to do pretty much what they want.

There are installations where all of the processors are local to one another and others that have their processing units scattered over a wide geographical area. There are installations where no two pieces of equipment are from the same manufacturer and, of course, others that permit only one manufacturer's equipment to be used.

There are examples of installations with very elaborate communication networks and still others with almost no communication at all.

Are all of these examples of distributed processing? The answer is not really important. What is demonstrated by the various implementations and philosophies is that for users there is a great need for many types of processing to satisfy individual corporate operating styles.

To date, there has been much to-do about the different distributed processing architectures or environments offered by the various computer manufacturers. These concepts are only important because they help a user understand what functions are being supported by that manufacturer; they are not an end in themselves.

Two-Faced Computing

Distributed computing is characterized by two distinct but closely related forms of processing — communications processing and dispersed data processing. Communications processing provides an intelligent pipeline that permits the effective transfer of data and control of the machine/machine interfaces. Dispersed data processing supports the man/machine interfaces that interact directly with the user.

Both are important, but to date most of the emphasis and support has been for the communications function because it must be well developed and integrated for most distributed processing networks to work even reasonably well. For this reason, network definitions and implementations are undergoing rapid development.

A network structure is chosen simply to support the goals and functions that an organization wishes to implement; it is not an end result in itself. There are two types of network organizations that are possible with existing hardware and software — the "star" hierarchical type and the "ring" type.

These two are like social organizations in that they are organized either hierarchically, with a powerful central computer acting as a feudal overlord of the system, or anarchically, with the system composed of an association of independent computers.

It is important to note that both kinds of networks can be constructed using the same heterogeneous components, although some manufacturers' network philosophies are

(Continued on Page S/16)

Distributed Data Base Easily Accepted

By John J. Hunter
Special to Computerworld

The speed at which the data processing industry introduces and adopts new methods and technologies is probably second only to that of the weapons industry. Usually the acceptance of these new technologies and methods is neither impediate nor across the board. Often there are a few leading-edge organizations that implement anything new, while the rest of the industry adopts a wait-and-see attitude. In fact, most organizations wait several years before committing themselves to any of the newer, more exotic brands of data processing.

However, distributed processing has been an exception to the rule. Almost from the beginning there has been a universal recognition of the inherently valuable features of distributed processing. Among these is the distributed data base application.

The concept of the distributed data base was adopted so quickly that it became part of the standard DP vocabulary even before it had been fully defined. Distributed data base is taken to mean both distributing the data base management function (the control and manipulation of data) and distributing the content of a data base (the data itself). These are two very different techniques with two very different realities.

The plain truth is that the distribution of the data base management function throughout a network is still in the planning stage. Today, a distributed data base simply means redundant data. Local copies of data are maintained at user sites, with most of the same data still retained in a centralized data base.

Movements and Countermovements

As the movement toward centralized data bases continues to gather momentum, the countermovement toward the distributed data base is also under way. Clearly some rethinking of data base strategy is called for in organizations that have already committed themselves to the centralized data base concept and are contemplating distributing this same data base.

Are data processing people hooked on change, or is there sound reasoning behind the distributed data base concept? The answer, to some extent, can be seen only through a historical perspective.

About a decade or so ago, everyone was moving from the old-fashioned idea of remote processing, in which just about everything was self-contained, to the sleek new discipline of centralized computing. The rationale for the move certainly made sense. You eliminated duplicate hardware and software, you needed fewer DP people and you could maintain tight control over the entire DP operation.

Of course, centralization caused some problems, too. The data bases became enormous; in a heavily loaded multiprogramming and/or teleprocessing environment, the data wasn't always available; line failures or other teleprocessing problems often separated the remote user from his data; and users were quite concerned about data security.

In addition, many central processors became overloaded when trying to handle too many jobs simultaneously. As a result, the incidence of missed schedules became alarmingly high.

Several solutions were offered to solve these problems. You could upgrade to more powerful — and expensive — machines (the money minders just loved that idea), or you could juggle job schedules and mixes to take the load off the machine. Users, however, wouldn't buy the latter suggestion if it meant delays, and who could blame them?

New Way of Doing Business

Since the usual solutions proved inept, some clever DP strategists came up with the idea of distributed processing. Under the "new" way of doing business, the processing logic and relevant user files (the data base) would be placed at or near the points at which the transactions occurred. This way the user's data would always be available and the worry about data communications failures would be nothing more than an unpleasant memory.

The idea of distributed processing caught on for other reasons, too. The advent of low-cost minicomputers with peripherals and processing power almost equal to those of some medium-scale general-purpose computers certainly presented a good case for distributing the processing.

With the load off the mainframe, propo-

(Continued on Page S/12)

DP Management Must Prepare For Distributed Systems' Arrival

By W. Fred Seigneur
Special to Computerworld

To some, distributed systems represent solutions to complex problems; to others, they create problems too complex for solution. However, distributed systems are coming and both DP and functional management must be prepared.

Navy Captain Grace Hopper often tells of a logging operation that uses oxen. When a log is too big for one ox, they don't send for an elephant, they use two oxen. So too with computers, according to some distributed systems advocates; use small- or medium-scale computer systems and add another computer as the work load increases.

If compatible systems (oxen) are used, the interface works. Suppose, however, we had to interface an ox and a horse? An incompatibility would exist.

A special interface could be designed and built, but at significant expense. This illustrates the hardware interface problem.

Now suppose two oxen were interfaced correctly, but they were not trained (programmed) to work as a team. A fight could develop or they could refuse to pull at all. This illustrates software incompatibility problems.

If both problems are addressed thoroughly, however, a successful network can be attained.

Data Control

Herb Grosch nearly blew a vacuum tube worrying about distributed data base control problems [CW, June 7]. Distributed data is a thorn in the flesh of many a distributed systems skeptic.

But the world is a distributed network. Each person in society has his own dis-

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This special report was prepared under the direction of Ronald A. Frank, Deputy Editor.

Firms Jointly Developing Net With Emphasis on Applications

By Michael A. O'Halloran
And John B. Knauff
Special to Computerworld

For the past six years, Rosemount, Inc. and Martin Marietta Data Systems (MMDS) have been deep in the process of developing a distributive processing network without really focusing on the facts or, rather, without letting the now-popular problems and fears stand in the way of doing it.

What is now fashionable to discuss in the trade is, in many ways, a reality despite the fact that a distributed processing network was not an explicit goal between the two organizations when we first decided to work together nearly seven years ago.

Did it just happen? Was it by design? Was it by default? Perhaps the best answer lies in a tracing of the relationship between these two firms.

In 1970, Rosemount stood poised on the brink of a period of very rapid growth, growth which is now a matter of record. The growth would take Rosemount into new markets and products which were substantially different from its historical aerospace and high-performance aircraft markets.

The systems which were in place and had served Rosemount well for many years were simply not adequate and not appropriate for the anticipated growth. New systems were required.

MMDS, then just beginning, offered managerial acumen, professional expertise and access to computing power — the very things Rosemount needed. The systems Rosemount sought to support growth were large, complex and elegant systems which required a degree of excellence and access to computing power — which, if Rosemount acquired on its own, would tax its resources.

Thus, the idea or concept became the "computer utility." Rosemount would use the services of MMDS to the degree required and pay for that which was used. There would be no charges for excess despite the fact excess was always present.

Focus on Applications

The focus of the effort was to be on the applications themselves, not on the fact that the very nature of the effort was an entry into the world of distributive or distributed processing.

The effort began, and Rosemount moved from a basic IBM 1620 card processing system, with primarily accounting functions computerized, to a remote job entry system with inventory, cost, materials requirement planning, order entry, general ledger and payroll applications. These systems were developed, implemented and operated by MMDS.

The anticipated growth was accomplished with Rosemount doubling in size in four years, rather than five as planned. The growth precipitated numerous changes; chief among them was the movement from a functional organization to a divisional organization.

The change in organization increased pressure on the corporate systems group to change parts of systems or develop new systems based on unique divisional needs. Each division and its product lines needed some slightly different data, a slightly different "twist" to a particular system or systems developed in different time frames.

The corporate systems group found itself in the position of constantly changing priorities; seeking interdivisional compromise where neither division really got the system they needed; or saying no. The systems started to be referred to as "your" system, rather than "our" system.

Corporate Systems Group

As the first five year plan drew to a conclusion and the next five years were addressed, it became increasingly clear that the corporate systems group needed to find a way to solve priority conflicts; provide for the divisions exactly the systems they sought and let the divisons know that the systems did in fact belong to the divisions.

The distributive processing concept seemed to be the answer. The catch phrase became: "We seek to move the power of the computer closer to the hands of the user."

Needless to say, the advent of the minicomputer and its development over the past five years offered much new food for thought.

As the concept was researched, it was found that any number of hardwares, or equipments, were available with little software support. Further, it was found that very few manufacturing companies of the size of Rosemount had ventured very far into the concept.

It appeared to those working on the mat-

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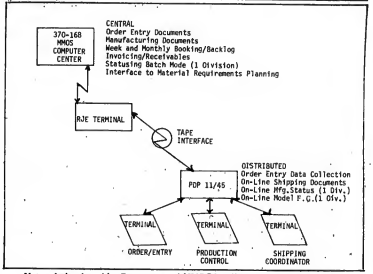

Network developed by Rosemont and MMDS handles a variety of applications.

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For Achievement of Goals

Distributed Systems Challenge DP Manager's Skills

Special to Computerworld

Many believe the fourth generation of computer systems will be chiefly distributed systems. This fourth generation adds new dimension to interdisciplinary cooperation between specialists because it calls for their awareness of the problems and needs of managers in other areas. Changes or additions to a distributed computing environment have a rippling effect on the entire operation.

In the past, management has been able to delegate system design problems to experts. Network design is also best left to experts, with one important difference. In system design, management can give the designer freedom to choose the best means of achieving a desired end result, such as an on-line system. In network design, management should actively participate in designing the means by which distributed processing is achieved.

In other words, it is not enough to instruct the DP manager to institute distributed processing within the next six months. Management must first decide on some corporate goals, for distributed processing is a way of doing business.

Furthermore, network design, like so many other organizational patterns, tends to be an ongoing, open-ended process. As the first set of goals is achieved new ones evolve, requiring new management decisions.

Distributed processing has been touted as the "cure-all" for business problems. It is true that distributed processing will alleviate some problems, but it is equally true that other problems will be created.

Fewer Headaches

Distributed processing definitely alleviates many of the headaches associated with centralized processing. Managers have long complained about response time delays due to an overload on a central computer and late reports that are out-of-date by the time they are received. The localized access to information, departmental control or data bases, with information audited at source, tends to solve these types of problems.

In addition, centralized operations tend to be more inaccessible, because too many DP shops work on the squeaking-wheel principle, i.e., grease the wheel that squeaks the loudest. Furthermore, the cost of providing backup for critical applications on large-scale computers tends to be quite high.

On the other hand, a manager involved with distributed network will find himself faced with all kinds of new questions:

- What is a fair division of the budget for computing services?
- What clauses should be inserted in a contractual agreement between the corporate suppliers and corporate users of computer services?
- How do you get managers to share computer resources?
- How do you give free access to computing resources and at the same time restrict access to privileged information?
- How do you bridge incompatible hardware and software that best meets users' needs?

Ideas can be organized into neatly separated patterns, but when brought into concrete forms, they get involved in compromises and blurred categories. Most companies will probably end up with a mixed bag of centralized and distributed functions. Very often, the final mixture is achieved through a trial-and-error process, as new patterns bring about new problems.

Determining what functions to distribute and how much to distribute are never clearcut decisions, and there are no specific guidelines that work equally well for everyone. Choices depend heavily on the type of business involved, the corporate structure, plant locations, future development plans and even personality.

The final shape of individual networks may be nearly impossible to predict, but the parameters peculiar to the network designing process are a little easier to get one's teeth into.

Any type of system design work tends to revolve around three types of parameters: the overall goals (usually general in nature), the tasks that are suitable for realistic manipulation (a very concrete, determining element) and the incorporation of new elements that allow for future change.

Usually, no one can quarrel with general overall goals a designer sets. A typical list might look like this:

- Reduce data processing costs.
- Increase job throughput.
- Improve system reliability.
- Improve real-time response times.
- Improve the quality of data processing services throughout the corporation.
- Make access to computer services easier for noncomputer-oriented personnel.

(Continued on Page S/20)

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Net Takes Something New, Something Borrowed...

By Elinor Gebremedhin
Special to Computerworld

When analyzing the hardware components peculiar to distributed networks as opposed to centralized ones, two types of components need to be examined.

The first category consists of the processing elements being linked together to form the network. When surveying this category, the question to keep in mind is: Are there particular types of equipment more apt to be linked together in distributed networks as opposed to centralized networks?

The second category consists of the communication link itself. Here we want to focus on the question of whether there is communication hardware peculiar to distributed networks because of the distinctive characteristics of this type of networking.

Devices common to all networks are:

- Teletypewriters.
- CRTs or video display units.
- Hand-held terminals.
- Remote batch terminals (high-speed input and output devices).
- Intelligent terminals (CRTs equipped with cassettes, stored program capacity and even disk storage and printers).
- Workstations (clustered terminals around a terminal controller).
- Industry-application-oriented terminals.
- Graphics terminals and plotters.
- Office computers (designed for magnetic ledger operations).
- Small business computers (often minicomputer-based).
- Minicomputers.
- General-purpose computers.

Binding all these together are:

- Modems, data sets and acoustical couplers.
- Satellite and terrestrial data transmission facilities.
- Common carriers.
- Multiplexers.
- Concentrators (often part of clustered terminal packages).
- Private branch exchanges (for line switching).
- Message switchers.
- Communications controllers.
- Communications processors.
- Communications software.

A centralized network presupposed a host computer and terminals. Terminals may be either "dumb" (hard-wired) or intelligent (programmable). In actuality, intelligent terminals, data entry equipment, intelligent remote batch systems, word processing equipment, etc. are all special-purpose minicomputer systems. Minis are used as controllers, dedicated to the particular system tasks needed.

In a centralized network, however, all are "terminals," pure and simple. Even another communicating processor "looks like" another terminal. Intelligence is irrelevant. They can be all intelligent or all dumb or a mixture — it's still a centralized system.

Using Intelligence

The very term distributed processing, however, presupposes two or more intelligent systems which share processing loads in some way or another. The key to the concept is not only tying intelligence into the network, but making use of the intelligence.

While all elements of a centralized system could be intelligent, the intelligence of the terminals is not a defining factor — all could be dumb. On the other hand, a distributed processing network is not a distributed processing network unless there is more than one intelligent component.

This defining element leads users to classify any system which is both intelligent and communicating as a candidate for a distributed processing network. Indeed, any such system is. The problem is that most terminals these days are being equipped with intelligence, and most intelligent processing systems are being equipped with communications lines! To complicate the matter further, "dumb" terminals can be included in distributed networks as well.

As we noted above, "equipped with intelligence" is another way of labeling a device with a mini- or microcomputer in it. The whole distributed processing idea really got off the ground when minicomputers were added to networks as remote "satellites," perhaps without host CPUs in the usual sense.

Most distributed processing systems will be built using minicomputers and small business computers. The philosophy behind minis — give a user what he needs to do a job — is simpatico with the philosophy behind distributed processing — make the data processing facilities fit the applications.

Two newer types of business minis, the personal computers and the word processors, particularly emphasize this trend toward local processing and, hence, distributed networks. Both are designed for nonspecialized, nonprogramming office personnel, and both consequently present interesting management and control problems.

Although many factors have combined to make distributed processing a reality, none has contributed more than minicomputers. The minicomputer proved to users that dispersing computer power resulted in quicker turnaround and lower costs. While super hosts were bursting user pro-

(Continued on Page S/6)

"Sycor service keeps my network uptime to 98.5%."

Bill Dierkes, VP Information Systems, The Keebler Company.

The Keebler Company, second largest producer of cookies and crackers in the U.S., has six bakeries and 63 distribution centers serving 90,000 retail outlets. Keebler's sales force of more than 1200 used to mail 40,000 orders per week to the 63 distribution sites, where processing and invoicing were done manually. The problem was, these orders weren't getting processed fast enough.

The installation of Sycor intelligent terminals changed all that. And established a new set of order processing standards. Operating at peak efficiency, invoices are now transmitted from the CPU back to the branch locations the same day orders are received. Keeping up this level of performance demands terminal and service reliability.

Keebler puts Sycor to the test.

After a year of operation, Information Systems VP Bill Dierkes wanted to know how reliable Sycor terminals and service were.

"I conducted a survey of 61 of our Sycor terminals from December, 1975 through May, 1976. Some of the terminals were in out-of-the-way places like Minot and Fargo, North Dakota; Billings, Montana; and Pocatello, Idaho. Places where service might be a problem.

"What I found out really amazed me. Naturally I expected the terminals to be reliable, and I expected Sycor to back them up with good service. But even I was surprised to find that, when a station went down, 80% of the time it was back up again in four hours or less. And 95% of the time in eight hours or less.

"When you consider that each location uses the terminal an average of eight hours per day, and that there are 127 working days in the six-month period surveyed, the total system was up 98.5% of the time."

A Sycor intelligent terminal is a management tool.

Beyond fast maintenance and reliability, Bill Dierkes has found many other benefits from his network of Sycor intelligent terminals.

"Price, ease of installation and the Sycor terminal's ease of operation were other factors I considered. But the real benefits emerged when the system was installed. As soon as it was up and running we were able to reduce order processing labor by 75%, inventory by 15%, and process 40,000 accurate invoices per week. My Sycor system is a real management tool.

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Distributed Processing Network Takes Something New, Something Borrowed

(Continued from Page S/5)

grams in tong batch processing job queues, the minicomputer users were getting responses in a matter of seconds, usually interactively.

Bureaucracy was not only eliminated at the computer site, but also during the purchase of the system. The cost of a minicomputer system ($8,000 to $150,000) is low enough that the system can be considered a tool rather than a major capital expenditure. Thus, fewer management levels need to be consulted when making a buy decision.

Communications Hardware

If minicomputers and intelligent terminals of all sorts are particularly characteristic of distributed systems elements, communications processors are particularly characteristic of network management hardware. There are three main types — front ends, concentrators and message switchers.

A front-end processor, by definition, is located with and attached to one or two specific host computers. Its primary function is to conserve the host computer's resources by assuming some or all of its communications management responsibilities. As a result, data received from a network can be presented to a host in a constant format and from a single defined source. The host can be essentially free of any direct involvement with network requirements.

In a distributed network, the front-end processor is used in much the same capacity, but it can interface its host computer(s) with the network's message-switching element instead of directly with terminals. In so performing, the front-end processor intercepts and controls all traffic between its host(s) and the network. In addition, the front-end processor can act as a controller for terminals and peripherals that are direct subordinates of the host(s).

Remote Concentrators

The remote concentrator, or line concentrator, can be likened to a front-end processor located away from its host computer rather than adjacent to it. In fact, many mini-based communication processing devices can be configured either as front-end processors or as remote concentrators.

In a distributed network, the remote concentrator can be used either to offload the host computer and to improve line utilization or as a network node. On the other hand, a general-purpose minicomputer or small business computer used as a network node can be configured to perform remote concentrator functions.

In networks where a large number of terminals exist at the remote site, the remote concentrator may be required to perform polling functions, in which case it would be involved in two different levels of polling: polling terminals and being polled by the host computer.

Message switchers have been variously called traffic directors, message routers and dispatchers. Unlike that of the remote concentrator, the message switcher's output is not necessarily to a host computer, but to a terminal, remote concentrator or another message switcher.

A message switcher can be based on either a general-purpose minicomputer or a special-purpose processor.

Circuit switching by the host computer in a distributed environment is strictly limited and is usually done only as an emergency backup. In networks where a number of remote terminals have to communicate with one another, as well as with the host computer, the use of a message switcher is cost-effective.

One major feature of a message switcher which a remote concentrator generally lacks is the ability to detect and act on a priority indicator. Also, the message switcher frequently acts on administrative data and text messages, whereas the remote concentrator

(Continued on Page S/10)

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Distributed Processing Advantage

Missing Link Provided Between Remote, Central Sites

By Fannie H. Reagan Jr.
Special to Computerworld

The concept of distributed processing is much like the theory of evolution. Each premise is so attractive and answers so many difficult questions that it is embraced without much hard proof of its validity.

Distributed processing puts the resources of a programmable, data storage system at the disposal of the personnel out on the firing line where a company's business is transacted. Branch managers are an independent lot. They must make many decisions to assure success.

Decisions are better made when based on accurate and complete information than when the manager is forced to guess or base his decisions on a "gut" feel. A small computer permits storage and manipulation of data to provide a more accurate and complete information base.

However, the manager must also, eventually, report back to headquarters. A communications link between the remote (distributed) computer and the host computer (central site or headquarters) simplifies passing (and possibly editing or delaying) summary and/or detail information back. Headquarters is happy because it can closely follow remote operations. Branches are happy because they have a powerful tool to use in day-to-day operations.

With so many benefits accruing from distributed processing, it follows that it should be the answer to many data processing problems. Let's take a look at the subject and see if this is so.

Useful data processing consists of four elements: data entry, computation, data storage and data retrieval/output. There are many tasks performed by a computer to implement these elements, but they are internal housekeeping chores that the user of information (as opposed to the processor of information) doesn't want to get involved with. Cost and availability of information are all that the user is concerned with.

Distributed processing must provide a clear advantage in one or both of these areas to be a valid concept. Stated another way, distributed processing must either provide a better way of handling information and provide something not available before, or it must provide a lower cost way of performing existing procedures. Ideally, it would do both.

Advances in remote job entry and interactive time-sharing clearly indicate that all tasks performed by an independent system at the remote site can be performed through a communications link to a central facility. In effect, a remote site operation becomes an on-site operation. But there is a cost, and a substantial one at that, to operate this way.

In general, speed of response is traded for cost so that many remote operations are slower than desirable and others are eliminated to reduce transmission volume. Location of computational, data storage and data output facilities at the remote site may provide quicker response to information handling needs.

Because of the high cost of communications, it may actually be cheaper to provide the *same level* of information processing through small remote computers than through remote access to the power of the general facility. In addition, many tasks may get done on a remote computer that would not have been submitted to a central facility because of the overhead of dealing with the central facility programming/operations staff.

On the other hand, skimping on remote site systems and programming personnel can reduce the benefits of local processing by limiting task implementation. Institution of central site programming and systems control reduces flexibility, but still permits the basic architecture advantage to be gleaned.

A similar argument can be advanced for data storage. The cost per bit for cartridge (or diskette) storage units is higher than for the central large disk units. The question of performance is neatly sidestepped by observing that few users access the small drives and many users access the large drives resulting in a standoff concerning performance. Storage at the remote site can be more flexible than central site storage.

With regard to data entry, experience over the past few years with key-to-disk systems and intelligent terminals shows that the closer to the originating source that the data can be checked or validated, the more efficient the data entry function. This is a clear plus for distributing processing.

The system advantages of distributed processing revolve around greater flexibility due to multiple processing elements and lower communications costs due to lower transmission volumes. It

(Continued on Page S/27)

DATA COMM NEWS
VADIC "Firsts"

1969 — Vadic designs complete OEM line of low cost Bell compatible 300 & 1200 bps modem modules & PC boards for terminal & computer systems manufacturers.

1970 — Vadic adds IBM & CCITT compatible modems.

1971 — For end-users, Vadic introduces 16 channel system where up to 16 modems & auto dialers can be freely interwined in 7" high chassis.

1972 — Vadic adds powerful displays & diagnostics, including EIA interface status lights, and local/remote loopback, making it simple to pinpoint problems on any part of a complex data communications system.

1973 — Vadic announces world's first full duplex 1200 bps modem that works on dial-up or two wire leased lines. Called "the most significant advance in modem design in years".

1974 — Vadic designs system which permits 60 modems to share a single automatic dialer.

1975 — General Electric now installs, leases & services Vadic modems at 50 plus service centers in US. 100,000th modem shipped by Vadic.

1976 — Vadic is first modem manufacturer to obtain certification for direct connection to switched networks in California eliminating need for Bell DAA.

Dear Ma:
While you've been painting telephones and calling on Congress ...guess what Vadic's been doing?

This clipping tells the story. Vadic has come up with more low and medium speed modem "firsts" than anyone — both for OEM's and end-users.

A prime example. Almost 4 years ago Vadic invented a full duplex 1200 bps modem that operates beautifully on either dial-up or 2-wire leased lines. Today, over ten thousand VA3400's are in use at over 1000 companies.

We increased the speed of our CRT's and other 120 cps terminals by four times when we replaced your 103's with VA3400's. And it took just a few minutes to change computer port speed.

You can't beat Vadic for service, either. General Electric installs and maintains Vadic modems at over 50 locations nationwide. And Vadic backs this up with 5 regional on-line diagnostic centers.

Better send for Vadic's 30 page brochure, Ma. It'll give you some young ideas.

Your independent thinking son,

Alexander Graham Jr.

PS: Vadic has shipped over 125,000 modems to date.

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Arrival of Distributed Systems Needs Preparation

(Continued from Page S/2)

tributed processor and data base. At a higher level, each office, department or plant of a business has its own distributed data files. Some files contain data unique to the local operation. Others are copies of data input from other offices, departments or plants (redundant data). Some data items are output to the other "nodes" or to the headquarters.

Computer people worry about distributed data base inconsistencies and time dependency problems. Possible inconsistencies of seconds or (perish the thought) minutes are sources of severe trauma to our kind. Like Grousch, we get bogged down by the bits. If we back off, we can see the world operating in a distributed mode at any instant.

Sure there are problems, but we cope. If we lose a data item, we can probably get it (or a pointer to it) by calling another office which has a redundant copy. Solutions to data inconsistency problems in distributed systems have been worked out. However, such techniques are not required as often as might be expected due to users' natural abilities to cope with everyday problems involving distributed data.

Rising Tide

Those of us who feel that distributed systems will be slow in coming better get prepared. The users are restless. The tide is on the way in. The sand is being eroded from under our big DP shops in the sky.

Middle and lower level management who for years have had the authority to hire personnel or purchase machinery which costs $5,000 or more per month are getting computers. These may be cleverly disguised as word-processing systems or accounting machines (complete with DOS, Business Basic and 10M-byte disk). Some are clearly identifiable, such as minicomputer turnkey business applications or the separate laboratory, pharmacy and other mini-based systems prevalent in hospitals.

The interface between departments in a company is still predominately paper. Offices with computers produce listings which are manually massaged, augmented with additional data and keyed into other systems at a severe cost in human and monetary resources.

Company DP officials must recognize this problem and cope with it before the sand gives way completely. Standards must be set for independently procured systems, and the need for adherence to such standards (perhaps at an extra cost or reduced benefits to the individual application users) must be sold to managers at all levels responsible for procurement decisions. Management of distributed resources must be considered and planned for, perhaps by the use of the computer applications group concept used successfully by some government organizations.

The job market is not overflowing with personnel experienced in distributed systems and applications. Until such time as textbooks are published and the technology becomes as common as operating systems, on-line applications and data management, seminars and consultants are the best source of assistance. Also remember, whenever a distributed system problem seems insoluble, step back. It's probably already been solved. We've been processing in a distributed environment for years.

Firms' Joint Effort Programs-Oriented

(Continued from Page S/3)

ter that for every plus of distributive processing, the issues of how to do it and how to control became very real. However, given the relationship with MMDS, the subject matter was neither new nor alien.

After examining the basic premises, software and cost restrictions, a criterion of what was to be distributed vs. what was to remain centralized was developed.

However, even this required an iteration, as the first effort resulted in the concept of essentially "splitting" the existing systems and moving them to machines to be located in and controlled by each of the divisions. The idea was simply to divide up or split what presently existed.

The second iteration revealed that the criteria of distribution and what was to remain was as follows:

Unique System	Distributed
Data Entry	Distributed
On-Line Systems	Distributed
Developed Systems	Centralized
Common Systems	Centralized

It should be noted that there was no particular pressure to distribute what was presently operating centralized.

Information Group

The next step was to organize the Information Group necessary to control and support the plan. The first part was to define a common development methodology to be used in the network. The MMDS methodology was adapted. The second part was to define what functions were to be performed where.

The corporate function will evaluate software and hardware and police the network. They will review the functional designs as well as provide advice and counsel concerning the experience of others.

The corporate group will ensure that the interfacing of data will be maintained. This group will control the programming of the systems initially, but will relinquish this control as the divisional staffs become self sufficient.

The individual divisions will build an analyst staff that will be responsible for planning, design and operation of their unique and on-line systems.

The divisional staff will report directly to divisional management. They will, in time, assume the programming responsibility.

Second Five-Year Plan

The second five-year plan is now 10 months into implementation. The divisions have started to build the analyst groups and one division is ready to start the development of unique systems. Evaluation of equipment and the concomitant installation of a small stand-alone computer in one division is now in progress.

The computer necessary to process the central load is being sized and a migration plan is being formed. A Digital Equipment Corp. PDP-11/45 that was previously installed for engineering purposes has been expanded and the distribution of the order entry system has been successful (see figure on Page S/3).

The benefits we seek from a distributive processing network still very much focus on the notion of putting the power of the computer closer to the ultimate user. In this

(Continued on Page S/13)

Source Data By ENTREX...

Remote/Data Terminals

Stand-Alone Single Terminal Systems 600/20

Multi-Terminal Business Systems 600/30, 600/50

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600 Series hardware is modular and upward expandable, allowing selection based on individual site performance requirements.

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Entrex is ready with a family of systems particularly suited to capturing and processing data at the source; a system alternative that can be implemented today, yet provides for tomorrow's growth; a system family that offers the network planner total flexibility in configuration planning.

In-House Mini Yields Dividends

Shoe Firm Stretches DP Dollars With Five-Site Net

By Mal Stiefel
Special to Computerworld

WILMINGTON, Mass. — Shoe manufacturer Converse Rubber cut outside service bureau costs by $8,000 a month after moving its statistical and forecasting programs to an in-house PDP-11/45 from Digital Equipment Corp.

The mini is primarily used in a distributed network that has yielded dividends in other areas over the last two years: Elapsed time from receipt of an order to shipment and billing has been reduced from two weeks to 36 hours and the keypunch department and clerical staffing have been trimmed.

The five-station network extends across the U.S. to support several essential company functions: order entry, shipping and accounts receivable. A finished goods inventory system, recently placed in service at one warehouse, is expected to be fully operational at all locations by the end of the summer.

In a departure from common practice, the configuration isolates the distributed network from the company's IBM 370/135 mainframe, located here in Wilmington. Data is transported "across the hall" between the two systems on magnetic tape, according to senior software technician Frank Sinclair.

Terminals, each containing a PDP-11/40 with 48K 16-bit words of memory and 40M bytes of disk, are set up in company warehouses in Contoocook, N.H.; Charlotte, N.C.; Elk Grove Village, Ill.; and Reno, Nev. The Wilmington unit carries 112K words of memory and 80M bytes of disk.

Each station also includes IBM-compatible magnetic tape drives.

The cut in service bureau costs was achieved when the company decided to convert its number-crunching market research programs, run by the operations research department, to the PDP-11/45. Fortran programs, which had been running on a variety of outside installations, were rewritten in Basic Plus for the minicomputer.

Data Base Updated Weekly

Every weekend, the main company data base is updated on the 370/135. Then the current files are dumped on magnetic tape and loaded on the disk at each station.

Files include the customer file, the product file and the size spread file, containing the range of sizes in which each type of shoe is made.

During the week, clerks at each installation enter orders interactively through CRTs controlled by the PDP-11, using order forms submitted by salesmen as source documents.

The displays are designed to prompt the clerks, leading them through the proper keying sequence for each order.

Each order is entered in three parts: the header (customer name, terms, discounts); the body (line items being ordered); and the trailer (requested shipping date, special instructions for packing and mailing).

As data is entered, the system validates product code, size and unit price of each entered line item against the stored data base. In addition, the computed total number of pairs of shoes in all line items is automatically compared with the total entered by the salesman. Requested terms (e.g., payment in 120 days) are checked against the terms granted to the specific customer (e.g., cash in advance).

If there are any errors, appropriate error messages are displayed and corrections are keyed in.

If errors are found in the source document (for example, if the price for an item is incorrect or if a product code is invalid), the clerk tries to correct the entry if possible; if there isn't enough information present to decipher the order, the entire entry is cancelled and the salesman is contacted off-line to clarify the matter.

After a complete order has been entered, the clerk is given the opportunity to review it and make final corrections.

If everything is satisfactory, the order is accepted. Accepted orders are recorded on disk at the installation. Ship-to and bill-to information from the customer file are added to the disk record.

If unresolved problems remain, the order is cancelled; when the difficulty is overcome (later in the day, perhaps) the order is reentered.

At the end of the day the accepted orders are copied to tape to await (at the remote sites) transmission to Wilmington after working hours.

About 500 orders can be transmitted in 30 minutes over 4,800 bit/sec dial-up lines.

Shipping Expedited

In Wilmington, transmitted data, together with the local orders entered in Wilmington, is moved to the 370/135, where the central open order file is updated. The program runs quickly, since extensive editing isn't necessary; that step was completed when the data was captured.

This routine also produces a series of five shipping order print image tapes — one per site — for transmission back to the originating stations.

Back in the warehouses, the data is loaded into the open order file and the shipping orders are printed.

The stock is pulled immediately for shipment. Back-ordered quantities and quantities shipped are noted on the shipping order for entry into the open order file.

The completed orders are then transmitted back to Wilmington, using the same tape-to-tape technique, where the invoices are prepared on the 370/135.

Cancelled checks from customers are sent to Wilmington, where clerks enter the check amount and the invoice numbers covered.

This data again goes to tape; off-line, the 370/135 credits customer accounts, automatically detecting underpayments and overpayments in the process.

This procedure alone eliminated 12 clerical positions in the accounts receivable department when it was installed. Previously, the accounts had been updated by hand.

Inventory Tracked

In one warehouse, a finished goods inventory control system keeps track of item quantities and locations (aisle, shelf, bin). The puff clerks interrogate the data base

(Continued on Page S/13)

Processing Systems
The Economic Alternative

PLANNED IMPLEMENTATION
The 600 Series can be implemented on an evolutionary and modular basis. Configurations range from 1) remote Data/Terminals connected via datacomm facilities, through 2) stand-alone single terminal systems, to 3) larger, multi-terminal, multi-tasking business systems. An extensive list of peripherals is also available to choose from.

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In addition to our asynchronous remote terminal capability, the 600 Series provides two distinct communications facilities concurrent with multi-terminal operations:

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Distributed Approach Saves Bank of America $13 Million

By Frank Vaughan
Of the CW Staff

SAN FRANCISCO — Bank of America here is using the distributed processing approach to a statewide teleterminal network with a capital savings of $13 million in hardware over the traditional large mainframe approach.

"We were able to confirm in a feasibility test in 1974 that we could save a good deal of money over the traditional approach to teleprocessing," Steve Ernst, Bank of America's vice-president for the project, said.

"Of course, money savings comes first. Secondly, the system has been designed to meet our own requirements and specifications. In other words, we didn't have to cut and fit what we wanted to do into something that was available off-the-shelf from one of the traditional mainframe suppliers," he noted.

"The simplest and most direct [cash benefit] to talk about is the capital savings," he continued. "For the initial applications that we're putting on the system, namely our statewide teleterminal systems, using large mainframes would have cost us $18.6 million for computers and related peripherals. This approach is costing us $5.6 million, so it's a straight $13 million savings in capital," Ernst said.

Although he does not expect to be in production until June, Ernst estimated the research and development time would be reduced by one year over what was originally projected and approved.

Of course, the transition to distributed processing has not been all wine and roses for Bank of America. There have been some problems to cope with, particularly in the software area.

"In doing any scratch effort, particularly one that involves operating systems software as well as special software and applications systems software, you're doing a different type of work than you may have been used to if your

(Continued on Page S/20)

Bank of America's system is based upon distributive computing modules, each containing four General Automation GA-16/440 minicomputers. The system will be used for network communication control, on-line data capture and teller inquiry applications. The bank will be using 14 modules or 56 minicomputers to handle inquiries from 10,000 terminals into a customer data base of 10 million accounts with an expected average response time of about three seconds.

Network Blends Old, New Things

(Continued from Page S/6)

typically acts on data intended to be processed in a computer.

Most users do not buy a whole distributed system. Instead, they take an existing network, perhaps add more intelligence to certain elements, change the software in the host and make other changes necessary to disperse processing. The impetus for these changes probably came from a need to expand. Instead of upgrading the host, a remote mini is added and the network architecture is altered.

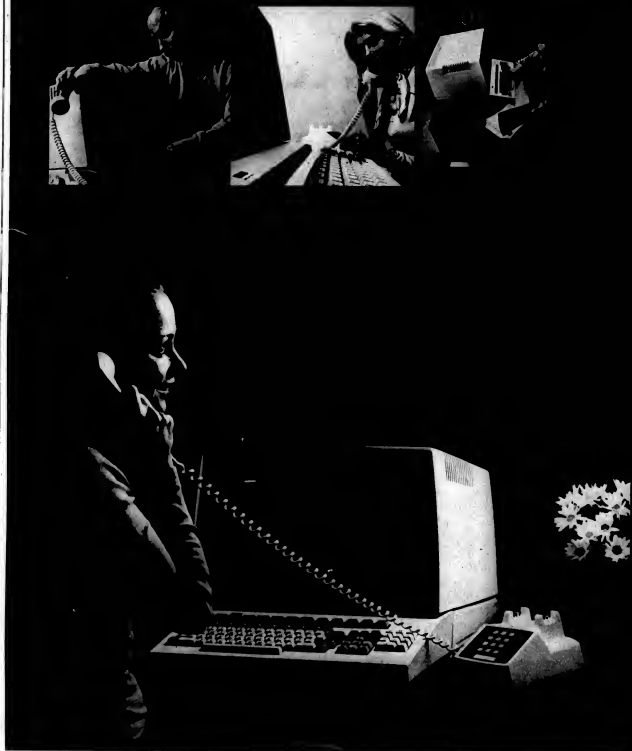
Selection of distributed processing system components should proceed from performing a study to determine functions and tasks appropriate or desirable for distribution, to a consideration of what classes of devices can perform those tasks and functions, to an evaluation of the various manufacturer's product offerings.

The operational organization of the business is the key to determining if distributed processing is suitable. The business structure also holds the answer to component selection once distributed processing has been decided upon.

When evaluating a particular manufacturers' equipment, the following criteria should be kept in mind.

- Compatibility — The equipment should support transmission disciplines that are compatible with the current installation and provide read/write media (magnetic tapes, disks, etc.) that can be used on other devices in the system. It should also have the capacity to be configured to support emerging bit-oriented protocols, such as IBM's Synchronous Data Link Control or Burroughs' Data Link Control.
- Software Support — Determine if the vendor offers packaged software to support the intended applications and if the packages operate on a dedicated basis or under the control of a multitasking operating system. The latter is generally more attractive since it allows the component to become, in effect, a multifunction device.
- Expansion Capacity — Determine limitations regarding memory and peripheral expansion. Can terminals be supported and can they be remote as well as local? Again, look for a multitasking operating system that will allow the device to perform multiple functions simultaneously.

Gebreneedhin is associate editor of Auerbach Standard EDP Reports. The article is extracted from Auerbach Distributed Systems Reports, Auerbach Publishers, Inc., 6560 North Park Drive, Pennsauken, N.J. 08109.



Minis Make Distributed System An Economically Feasible Option

By Kenneth G. Harple
Special to Computerworld

While it is true that distributed processing may be the single most important factor in the future growth of the minicomputer industry, it is also a concept whose time is now.

Distributing the power of the computer to the operating level where it is most useful has already emerged and established itself as a major technique for increasing the efficiency of a computer operation to the benefit of the users. In addition, the future growth of the phenomenon appears to be limitless.

Simply stated, distributed processing is the most popular term in the computer industry in many years. However, it is also one of the least understood and most confusing concepts, with more different meanings to different people than perhaps any other at this time.

Ever-increasing numbers of users are realizing the benefits of handling data or controlling industrial processes locally via minicomputer-based networks rather than attempting to do everything on a single large central computer.

One study, just released, reports that shipments of computer systems to be utilized in distributed processing configurations accounted for 4% of the $20 billion worth of hardware shipped in 1976, or $800 million.

The same report further projects that the 4% figure will escalate to a 17% share by 1980, or $5.6 billion worth of computers to be installed for distributed applications.

Virtually all of the computer manufacturers, large and small, are acutely aware of this trend away from centralization, and most are gearing both hardware and software development plans to provide additions to existing product lines which would allow them to compete for a share of the market.

Perhaps the biggest single factor attesting to the viability of distributed processing was IBM's recent introduction of its Series 1 or "Peachtree" family of small computers which are priced as low as $10,000. Many industry followers feel the Series 1 introduction is indicative of IBM's stamp of approval on the trend toward decentralization, as well as acknowledgement that an increasing number of applications do not belong on large central machines.

Definition Difficult

There is a problem in establishing a definition of distributed processing that would be acceptable to most users. The concept has been described as spanning a wide range of functional capabilities — from intelligent terminals that edit and format data before transmitting it to a central processor to the integration of a number of processors into a communications network — thus allowing different tasks to be processed on different machines.

It is becoming increasingly clear that the trend is toward the distribution of processing functions as well as portions of the large central processor data base. This emphasis on distributing both the processes and part of the data base has resulted primarily from the need to relieve some of the pressure that has been building in many complex mainframe configurations, coupled with the availability of data communications facilities and the increasing capabilities and low cost of small computers and terminals.

It is this area, where both the process and portion of the data base are dispersed which is true distributed processing, as opposed to simple remote terminal applications, where only a small portion of the processing activity has been removed from the central processor.

The true objective is to place the processing power where it is needed and make it as independent as possible of other processing activities within the organization.

The minicomputer network represents true distributed processing in its highest form at this stage in the development of the concept, where the dispersed processors can perform their dedicated functions as well as serve many other purposes. Included among these other functions are the ability to access each other's data files and programs, provide reports to the central location as well as other sites as needed, perform diagnostics, provide backup to other satellites in the network should a failure occur and shift a portion of a task to another site in the event that one or more satellites

(Continued on Page S/24)

Distributed processing has never been easier. Or better.

For a long time now, we've been in the business of making information easy to use. So it's only natural that we'd evolve a system designed to make distributed processing as easy and productive as possible.

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It took time.

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- Applications definition, design, development and maintenance in a distributed environment.
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- Reliability, Integrity, security, and privacy in Distributed networks.
- Evaluating vendor Distributed Systems offerings.

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Now you're ready, and so are we . . .

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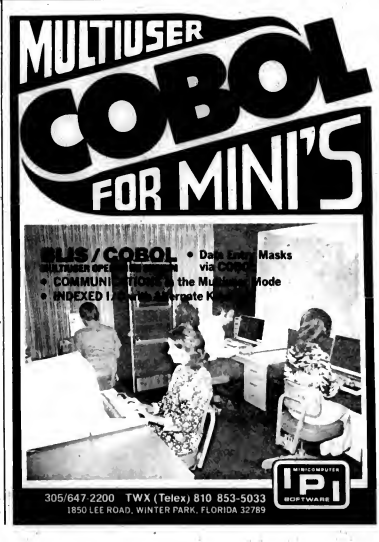

Concept of Distributed Data Base Readily Accepted

(Continued from Page S/2)

nents of distributed processing claimed that the high-cost large-scale systems were now unnecessary and could be returned to their makers (the money people also appreciated that idea). In addition, the data base would be smaller, as would the size of the application programs. Or so it was thought.

In this bright new world, the minis (or processing nodes as they've been dubbed) would operate autonomously at the local level, but would also be part of a processing cooperative. In the cooperative, for example, certain nodes could be dedicated to handling certain types of jobs. The nodes would also pass requested parts of their data bases to other nodes.

The autonomy offered by distributed processing also prompted some system designers to think about employing multivendor networks. After all, if you're no longer tied to one system architecture or vendor why not shop around for the best deal with regard to both performance and cost? By playing mix and match around the network, one could attain the best processing performance with few tradeoffs to satisfy architectural guides.

Less adventurous users felt the single-vendor approach was better, since it offered a common architecture that, among other things, would lead to compatible software as well as common access methods. These people showed some vision.

There is nothing wrong with employing several vendors' equipment in your network, as long as you don't plan to directly share data among nodes. If you do, you run into such problems as data incompatibility among machine architectures, incompatibility of data access languages and incompatibility of access methods. There are solutions, however, which are discussed later.

Distributed Software

The champions of distributed processing had to be hardware people. Software types would have been too discouraged by the problems.

Two of the major questions are: What do you do with existing applications? How do you distribute and manage the data base?

Most installations large enough to consider distributed processing probably have huge libraries of application programs. These programs more than likely are quite large and are written in Cobol. If minis are used for the nodes, there are two obstacles to overcome: many minis do not presently offer Cobol compilers (although this picture is rapidly changing), and how do you shoehorn a large application into a small core area?

Regardless of the obstacle you encounter, you'll have to rewrite the application, and since the chief mini languages are Fortran, Basic and RPG, you may have to find new programming talent. Rewriting programs may mean scrapping program libraries that took millions to assemble.

Distributed processing proponents also claim that distributed programs will be smaller. Is this really true? It all depends on the language you use. If you write in anything other than Cobol, your applications will be smaller. But that's a benefit of the language, not of distributed processing. Is an ANS Cobol program written for a distributed mini any smaller than the same one written for a 360/370? You might be processing against smaller files, but we doubt whether the application itself will be smaller.

When writing new applications to run small-core, limited direct-access minis, programmers will also have to think about constructing efficient modules. This might require some retraining for those who have been writing for large systems or those trained in structured programming.

Integrated Corporate Data Base

More and more companies recognize the corporate data base as another of their resources — just like machines, money and people. Consequently, any change or movement of this resource is of major importance to an organization. Most centralized data bases operate under the integrated corporate data base (ICDB) concept. Before we consider the distributed data base; it might be well to review the elements of a centralized data base, the ICDB.

An ICDB environment can be defined as the consideration of the collection, storage and dissemination of data as a logical, centrally controlled and standardized utility function.

It should be emphasized here that the ICDB is not a system; rather, it is a concept under which the information system structure should be implemented. This implementation, using the ICDB concept, requires development of the five functional elements. The five elements of the ICDB are:

- Data Bank — the logically centralized repository of all the data utilized in a corporation.
- Data Dictionary/Directory System (DD/DS) — the repository of all definitive information about the data bank, such as characteristics, relationships and authorities.
- Data Base Administrator (DBA) — a person responsible for coordination of all data-related activities.
- Data Base Management System (DBMS) — a software function performing the storage, retrieval and maintenance of data.
- User/System Interface (USI) — the subsystems necessary to permit multiple classes and types of users to direct the system to structure the available data effectively into information and thus communicate with and fully utilize the resources at their disposal.

Since a centralized data base is a collection of logically related files at one location, then a distributed data base is a logical integration of related data bases at a number of locations. There are various reasons for the necessity of this integration, two of which are paramount: it permits users to produce reports summarizing information from different locations and it provides a means of employing data stored in another data base. Neither of these reasons precludes a distributed data base with no redundant data. And although such a setup is technically feasible, we believe it is operationally undesirable for reasons of backup, security and integrity.

Let's look at some design considerations for a sound, shared, distributed data base. First, the design must be compatible with all systems within the network. The data base organization, to be easily implemented and maintained, should be standardized, and the accessing languages and data access methods should be compatible with all systems.

To accomplish this, some major problems

(Continued on Page S/27)

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CUSTOMER NEED	FEATURES	PERKIN-ELMER FOX-1100	ADDS 520	LEAR SIEGLER ADM-3	DEC VT-52
Easy-to-Read Display	9 X 12 Matrix for highly legible characters	Yes	No	No	No
	Black on white or white on black display	Yes	No	No	No
	Display at eye level	Yes	No	No	No
	Display set deep in hood to reduce glare	Yes	No	No	Yes
	Full 24 X 80 display	Yes	Yes	Option	Yes
	Full 96 character set, upper and lower case	Yes	No	Option	Yes
	Easy-to-find block cursor	Yes	No	Option	No
Ability to Enter Data Anywhere on Screen	Complete cursor addressing and control	Yes	Yes	Option	Yes
High Operator Throughput	Tab stops that can be set to any column	Yes	No	No	No
	Tab key	Yes	No	No	Yes
Low Operator Fatigue	Backtab key	Yes	No	No	No
	Shiftlock key	Yes	No	No	No
	Typamatic repeat on all keys	Yes	No	No	No
	Separate print key	Yes	Yes	No	No
	Backspace key	Yes	Yes	No	Yes
Convenient Switching Local/On Line	Local-remote mode key	Yes	Yes	No	No
Simplified Interfacing to Printer	Fully buffered port to make printer speed independent of CRT speed	Yes	No	No	No
Easily Accessible Mode Controls	New line enable key	Yes	No	No	No
	Autoline feed key	Yes	Yes	No	No
	Scroll enable key	Yes	Yes	No	Yes
High Speed Numeric Input	Integral numeric pad	Option	No	Option	Yes
Simplified Program Debugging	Transparent mode and displayable control characters	Yes	No	No	No
Cost Effectiveness	OEM price in quantities of 25 for basic unit with 24 X 80 display	$971	$1195	$1080	$1476

*In quantities of 25.

To Enhance Productivity

Distributed Systems User Should Heed Purchase Tips

BURLINGTON, Mass. — Distributed processing systems are tools which can enhance the productivity of organizations with widespread operating facilities. Some features a manager should look for in a distributed processing system have been suggested by Inforex, Inc., a manufacturer of such systems.

A large percentage of applications will be transaction-oriented, in that operators will enter, retrieve or validate one record at a time, Inforex said. It is important that terminals be easy to use, the company noted. Therefore, terminals should feature:

- Large display screens, able to accommodate a full-page source document in a single screen image.
- Easy-to-read dot matrix characters in upper- and lower-case.
- Cursor keys to facilitate cursor positioning.
- Nondestruct cursor movement.
- Movable keyboards.
- Programmable function keys.
- Error display messages.
- Operator prompts.
- Video highlighting.

Operators at remote locations are likely to spend as much as 80% of their time at the terminal entering data. The following, Inforex suggested, should be standard:

- Automatic logging, to ensure data integrity, and enable users to measure operator performance.
- Easy methods of inserting and/or deleting records.
- Field definitions.
- Check digit specifications.
- Range checks.
- Error control via keyboard lock, audible signal or error message display.
- Table look-up facilities.

When looking for system programming, Inforex recommended users look for:

- An industry-standard, high-level compiler language.
- Fully implemented interactive language capabilities.
- The ability to select from one or more of these languages.
- The ability to mix languages.
- Programmability down to the single-terminal level.

System planners, looking for power and flexibility to meet their needs, are reminded to look for:

- Both multitasking and concurrency, allowing both multiple access to a data base and performance of more than one job at a time.
- Ability to provide both batch and transaction processing.
- Provisions for both stand-alone and clustered configurations.
- Ability to dedicate the system to either one large application or multiple applications.
- Multiple methods of accessing locally stored files.
- System security.

In communications areas, Inforex said users should expect their equipment vendors to:

- Provide an industry standard protocol.
- Provide terminal to terminal communications.
- Permit control of a distributed system from a central location.

Shoe Firm Stretches DP Dollars With Net

(Continued from Page S/9)

through a CRT to find items to be shipped.

The company plans to replace the operating systems in the 11/40s with DEC's RSTS-2780 package, which will allow transmission and keying simultaneously. (The 11/45 in Wilmington already has this capability.)

Currently, the on-line operations must be shut down and a new supervisor loaded before data can be exchanged with Wilmington.

Another 16K words of memory will be added to each system to accommodate RSTS-2780 and to maintain existing throughput levels.

The 370/135, with 240K bytes of core, has 16 Mohawk-Marshall 2314-equivalent disk drives with a total capacity of 462M bytes and six IBM 3420 tape drives. It runs five DOS/VS partitions under Grasp.

Several firms wrote the PDP-11 applications software from Converse Rubber's design specifications: Evans, Griffiths and Hart, Lexington, Mass. (billing); Dataventage Systems, Burlington, Mass. (order entry); ADL Systems and Infodyne Systems, both of Burlington, Mass. (accounts receivable).

Firms' Joint Effort Programs-Oriented

(Continued from Page S/8)

way, each user or set of users can approach a particular system in a style or manner most consistent with its particular products, markets and management postures.

Yet, each division can have access to the large and powerful logics required for core or central systems.

For example, each division very much wants and needs access to the massive logics of material requirements planning. Yet, each division takes a slightly different managerial approach to its exercise.

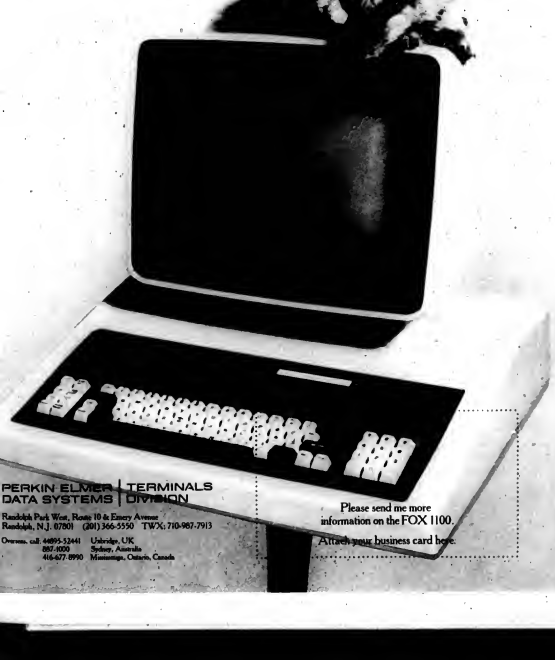
Thus, by giving each division the power to slightly modify the front end of material requirements planning, we can still preserve the base logic which neither division could develop, let alone afford, on its own.

In a sense, it is a way of providing a degree of front-end customization and processing efficiency not available in only one system.

And, in addition to seeking the benefits of putting the power closer to the end user, economic benefits, in terms of processing efficiencies, will be accomplished.

It is the feeling of both Rosemount and MMDS that we certainly do not have all of the answers to the many questions posed by distributive processing; however, we are getting much smarter in terms of the questions to ask.

Michael A. O'Halloran is resource manager at Martin Marietta Data Systems. John B. Knauff is director of planning, systems and material for Rosemount, Inc.



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Railroad Builds Own Terminals Matching Micros With Minis

By Don Leavitt
Of the CW Staff

ATLANTA — Southern Railway, based here, is "highly oriented toward distributed processing" — to the point of acquiring some 80 microcomputers so it can build intelligent terminals the way it wanted them, according to Jack Jones, the railroad's vice-president.

The line has received a fair bit of publicity on its efforts over the past six years to automate its large yards, starting with the one in Sheffield, Ga.

And Jones is certainly proud of what he and his staff have put together for that kind of operation.

But he seemed equally pleased with what the railway is doing now to ease the workload and lower the cost of running the system's smaller yards and sales offices. That's where the micros fit into his plans.

In the bigger yards, Data General Corp. Nova 3/D minis are linked to an IBM 360/65-370/158 combination at the corporate data center.

Jointly, they make up a system that routes cars through the yards, throwing switches, controlling locomotive speeds and checking outside conditions that might affect the operation, Jones explained.

Although the setting is quite different from those in which the term "process control" is usually applied, that is a good way of describing part of what goes on in the big yards which use humps to help car movement, Jones said.

But there is also an information-control system, he added. The railroad has to maintain an inventory of cars, by type, in various parts of each yards, so that trains can be put together as economically as possible, for example.

The yard in Sheffield actually has two sets of the DG minis — one for process control, the other for information — with links between the two so they can exchange data, he noted.

Economical Information Control

Once the systems for the big, humped yards were designed and in several instances installed, Jones turned his attention to the more numerous flat yards and sales offices maintained by Southern.

There was no need for process control for these yards, but he still wanted to put information out to the yard personnel on a very economical basis.

Such a system would probably work on an exception basis, he reasoned, doing such things as keeping track of where everything is, issuing work orders for switching cars and providing the work standards for interstring movements.

Exception reporting is one of the tenets of Jones' definition of distributed processing. To keep the railroad's private microwave network as open as possible, he said he has no periodic reports coming in from or going out to the yards.

Instead, about two hours before a train arrives at a yard, information on the train is sent down the line.

"And we don't get anything back (unless we ask for it) until cars leave the yard at which time, as the train goes out, the local unit sends a message back to Atlanta," Jones explained.

"Sounds simple, but it works," he continued.

The Four Rs

Jones is a devotee of small machines, arguing that they provide him with "a lot of things starting with 'R': reliability, recoverability, restart capability, responsiveness.

"If I want to continue my career path with the railroad, I don't want to put all my eggs in one big machine that could put the system down," he said.

Up till now, much of the communication between Atlanta and the company locations outside the big yards has been handled at the remote sites through Univac DCT 1000s — "dumb buffered terminals" — and Jones had been considering replacing them in order to speed up the operation.

He looked at various intelligent terminals, but wasn't happy with what he saw. Products then on the market "were put together the way a vendor thinks we ought to use terminals, and all seem to have some extra feature or some lack of capability" compared to what Southern wanted, he stated.

'Overwhelming Advantage'

About that time, DG introduced its Micronova and Jones immediately saw it could provide an "overwhelming advantage". The new unit was program-compatible with the Nova already in place and he wouldn't need a different set of people to learn new operating systems and pro-

(Continued on Page S/24)

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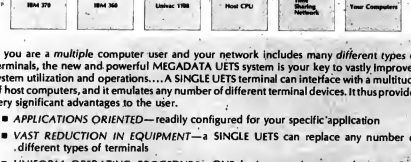

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Variety Makes Definition Elusive

(Continued from Page S/2)

predisposed to either a hierarchical or ring structure. Both types also share the problem of no overall management of resources.

There is a third network structure that may be possible at this time, but not with standard off-the-shelf hardware and software products. This is the hybrid: a mixture of hierarchical and anarchical (ring type) structures. This type is also referred to as the fully distributed network or one in which any combination of network processing arrangements is possible. It is possible to "internet", between the two types, but this activity calls for a high degree of sophistication on the part of the implementor.

Ring Networks

Unlike star networks, ring networks imply the presence of at least two computers with neither computer dominating. Ring networks can consist of a collection of identical computers or a mixture of different computers. Major characteristics of ring networks are:

- Members are self-contained computing sites or stand-alone processors capable of providing extensive local applications power.
- Membership has a price; some additional featuring or hardware may be needed to standardize communications.
- Communications may be either interactive or batch-oriented but is usually interactive.
- Communication between any two members is possible.

The most obvious difference between the ring and the hierarchical organization is the absence of levels of graduated computing power in the ring network. Also, communications between the member computers are usually interactive rather than batch-oriented and need not follow predefined paths.

Individually, members of a ring network can support hierarchical networks of their own. For instance, one computer might support a hierarchy of terminals to which all the other computers in the ring have access. This case is sometimes called a hybrid network. Additionally, membership in one ring does not preclude membership in another.

Star Networks

The simplest and most common kind of network currently being employed is the hierarchical star network in which one computer plays host to terminal or peripheral devices that may be situated either locally or remotely. The majority of computer installations fit this pattern. Most of the available system software is devoted to star network support. Major characteristics of star networks are:

- Graduated computer power applied throughout an organization.
- Restricted communications between levels with rigidly defined paths from level to level (although when using dial-up lines more flexibility is permitted, as low-level computers can talk over the heads of their immediate superiors).

The various types of hierarchical distributed processing range from very simple activities such as distributing printed output, to support of remote batch terminals, to highly complex distributive job processing systems.

The pattern of distributed hierarchical networks can fit several corporate organizations. The classic example is the case of head office, regional computing centers and tributary branch offices. But the network components do not necessarily have to be geographically separate. User departments or university faculties could be substituted for the regional computing centers and online system users or remote batch terminals for the branch locations.

Literature devoted to distributed computing (alias computer networking, distributed processing, hierarchical processing, resource sharing, etc.) has been voluminous. In article after article, the subject has been discussed over and over again. But if one examines these articles closely, it becomes apparent that the term distributed computing and all of its aliases tend to be used interchangeably with terms from the data communications lexicon.

Data communications, however, is only the cornerstone of the interdisciplinary foundation needed for understanding and implementing distributed computing, not the whole structure. The other factors involved include a strong understanding of management techniques, processing hardware (not just large mainframes, but minis, intelligent terminals and small business computers as well) and software (operating systems, data base management systems and applications programs).

Collohan is managing editor, Auerbach Computer Technology Reports. This article is extracted from the Distributed Systems Reports, Auerbach Publishers, Inc., 6560 North Park Drive, Pennsauken, N.J. 08109.

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Public Warehouse Net Tracks Massive Diversified Inventory

HOUSTON — Gulf Atlantic Distribution Services, a divison of Anderson, Clayton & Co., a food processing company headquartered here, operates a chain of public warehouses across the country in 13 separate locations. In these facilities, which contain millions of square feet for the storage of assorted goods and articles, Gulf Atlantic maintains many thousands of different items for many hundreds of different clients. Goods are moved out and in with great velocity. All these items have to be accounted for, both for billing purposes and to insure that the goods are there when clients need them.

"It's a massive accounting problem, with an incredible bulk of detail," Emory Wellman, president of Gulf Atlantic, said. "For that reason we've been especially interested in utilizing computers to see if they could help us. We had installed two or three pilot systems from as many manufacturers in our warehouse operations, but they couldn't handle the job," he said.

"Then we tried Datapoint Corp., specifically its Datashare/5500 and 2200 configurations. These systems gave us a powerful source of on-site computer power as well as the ability to communicate with our company's large central processor in Dallas for development of summary information and other management reports," he said.

Four Warehouse Installations

Datashare systems are currently installed and in operation at four of Gulf Atlantic's scattered public warehouses — in Arlington, Texas; Atlanta; Denver; and New Orleans. The Arlington installation incorporates a 5500 processor and six Datapoint 3600 data terminals.

The Atlanta installation utilizes a 2200 central processor and five 3600 stations. Denver has a 2200 system and three 3600 terminals, and at the most recent installation in New Orleans there's a 2200 with three 3600s.

Each of these installations also has a 300 line/min printer and associated disk data storage units: two mass storage units in Arlington, capable of storing 50M characters on replaceable disk packs, and dual cartridge disk units in the other locations, capable of storing 5M characters of information on replaceable cartridge units.

The configuration in the warehouses can be accessed by up to 16 3600 terminals with the 5500 processor and up to eight with the 2200 processor. The 3600 terminals allow the operators to have full use of the storage and computing capability of the central processors, but at a fraction of the cost, Wellman said.

These terminals are equipped with a standard typewriter keyboard and 11-key numeric pad for data input as well as an 80 character by 24 line video display screen. The screen is used to display data being entered which the operator can scan for possible errors.

Input Simplified

Operators enter information relative to movements of inventory in and out of the warehouses and for associated billing purposes from source documents. The screens of the 3600s can be used by the operators to display a sequence of preprogrammed "formats" corresponding to the source documents being worked, Wellman explained. The terminals are programmed to reject certain types of entries for specific input application if the inputs fail to conform to preset range guidelines or symbol conventions.

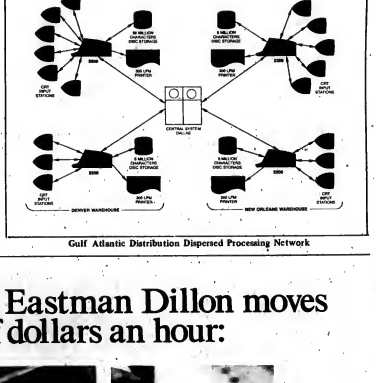
The combination of these features in the equipment has helped to sharply reduce input errors in converting from source documents, which had been a cause for considerable confusion and unnecessary cost in the past, he noted.

The terminal units are used to generate many critical documents and reports, such as warehouse receipts and delivery orders. The systems are also used for account maintenance and item maintenance. Special instructions for stored goods handling can be introduced into the appropriate item or account file.

Duplicate copies of delivery orders can be used as the basis for "picking" instructions for warehouse employees. The random-access memory units allow each operator to have access to precise information on the location of every item stored in the warehouse, which lends itself to more efficient utilization of employee time and equipment, Wellman said.

Another important feature of the system is the ease with which an operator can be trained to use the terminals, he added. "My

(Continued on Page S/27)



Gulf Atlantic Distribution Dispersed Processing Network

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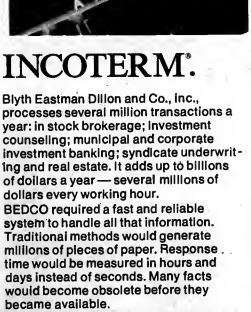

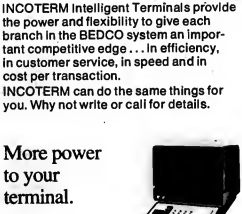

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Future Rests With User

Intelligent Terminal: Defense Against Murphy's Law?

By Paul LaVoie
Special to Computerworld

How, and how well, business data processing worked has always been the result of the operation of two competing laws.

Murphy's Law — "if anything can go wrong, it will" — is familiar to all managers. Grosch's Law, the driving force behind the move to bigger and bigger centralized computers, is less familiar. This is the law that has, in the main, governed the way systems for processing business data are organized.

Now Murphy's followers — not people who do data processing but people who *use* DP and who are part of the line operation of a business — are strongly advocating a new structure for DP, the distributed system. And their voices are being heard in many industries and in many functional areas (general manufacturing, utilities, industrial distribution, insurance, transportation, warehousing and banking, to name a few).

For example, a large U.S. manufacturing organization has one center to provide DP service to all company locations in the U.S. and Western Europe. Multiple levels of terminals are linked to the center by data communications, and they perform network functions and local processing and data storage. But about 95% of the processing and data storage is still done at the central site, with results delivered to the outlying locations via the communications network.

Grosch's Law

To date, Grosch's Law — "computing power increases as the square of the price" — seems to be controlling the pattern of DP in this company. The company seems to be taking advantage of the fact that if one computer costs twice as much as another, it will have four times as much computing power. This was a valid justification for building bigger and bigger central installations.

But the company is about to shift the bulk of the processing and storage of data outward — to take advantage of a shift in the weighting of cost factors and in deference to Murphy's Law. The company is about to convert to distributed processing by replacing existing terminals with a new generation of intelligent terminals.

The prediction is that within 10 years, as existing terminals are replaced, only about 20% of the DP and storage will be done at the central site, and the other 80% will be at or close to the end-user sites. The tools of DP will have been put in the hands of the end users, Murphy's followers.

Cost Factors Shift

What do we mean by a "shift in the weighting of cost factors?" To begin with, the three levels of a distributed processing system are the microcomputer, maxicomputer and the intelligent terminal. A glib definition of the three: the micro is something that can be picked up by two fingers, the intelligent terminal by two hands and the maxi by two elephants.

What makes a terminal intelligent is the fact that it's not necessary to send intelligence to the terminal from the maxi, or host computer. Intelligence resides in the terminal in the form of a microprocessor, a computer on a chip. The micro has its own vocabulary of instructions, the ability to store sets of instructions (programs) and the ability to execute the instructions in the same way that the maxicomputer does.

Thus, intelligent terminals are capable of decentralizing, or distributing, the work of DP. In a typical business application of distributed processing, the central site computer becomes more of a "data exchanger" and less of a data processor as more data manipulation tasks are absorbed by the terminals.

Benefits Slipping

Why, after more than 10 years of unrelenting and abrasive programs to centralize data processing, is there now a countermovement to unload the large, central maxicomputers by distributing selected processing functions to a network of intelligent terminals? Some of the reasons are emotional, some have to do with business convenience and some are based on cost factors.

Most importantly, the cost-effectiveness of the big maxicomputer has slipped. The cost of terminal hardware, compared with the cost of maxicomputer hardware, looks better and better thanks to the advances of technology.

In simplistic terms, for every dollar spent on hardware the intelligent terminal is clearly more cost-effective than the maxicomputer in manipulating data (up to the limit of its capability) — and the maxicomputer is clearly more cost-effective in the storage of massive files.

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Seven tough problems in "On and how Tandem's "NonStop"™

The Tough Ones.

1. System Down—Processor Failure.
2. System Down—Disc Failure.
3. System Down—Repairing Hardware.
4. System Down—Restoring Data Base.
5. System Down—Software Failure.
6. System Down—Changing to a Larger Processor.

Lots of things change when you go "on-line." Mostly for the better. That's why this is the most important trend in data processing today. But the one area which concerns management the most is "What happens when the computer goes down?" It's a good question, and until Tandem introduced "NonStop" processing last year the answers weren't pleasant. Service is interrupted; that's bad enough. But there is worse news still. At the instant of failure, a transaction in process could be lost (or duplicated), a record being updated could be destroyed, or a pointer, changed incorrectly could cause the loss of untold records. In short, loss of service is the surface cost. Loss of data base integrity is an even greater problem. Tandem's NonStop System, hardware and software, is the first top-down, designed-in solution to both these problems. To make it even better, we've designed it so it's easy to program, easy to expand, and easily the most efficient transaction processing system around.

1. System Down—Processor Failure. Every computer will fail sometime. The bigger they are, the more often they fail. Tandem has replaced bigness with a unique multiple processor architecture. Workloads are shared by the processors under control of Guardian, the only NonStop Multiple Processor Operating System available regardless of price class. When a component fails, Guardian automatically reassigns both processor and I/O resources to ensure that in-process tasks including file updates are completed correctly. You decide the priorities; Guardian does the work. And no interruption of your "on-line" workload occurs. Restart is virtually instantaneous.

2. System Down—Disc Failure. When one of your disc storage devices fails in the middle of a file update, unknown damage to the record, to record pointers, or to indices can occur. Enscribe, Tandem's NonStop Data Base Record Manager, ensures that the damaged record is restored; and, with our optional Mirror Volume duplicate file technique, that operation is continued using the back-up file. The back-up files are created automatically and are used by Enscribe to improve system response time. When the down disc is repaired so are its files, automatically, by Enscribe. You decide which volumes to back up; Enscribe maintains them, and no interruption of service occurs.

3. System Down—Repairing Hardware. With any system, a hardware failure must be repaired. But only with Tandem can the system keep operating, right through the failure and through the repair, too. Tandem's Customer Service Representative can remove and replace any failed module in your system without interrupting service. The operators at terminals and the programs in process are totally unaware of either the failure or the repair. And routine maintenance, too, is performed with the system fully operational. This is one more unusual feature of our system, but without it, no system can truly be called "NonStop."

4. System Down—Restoring Data Base. When a hardware failure occurs during file update in any "on-line" system which is not NonStop, there is every reason to question the integrity of the data base. Integrity of the data base is crucial. For this reason, elaborate procedures to maintain restart points and backup files are required in almost all "on-line" systems. Not with Tandem. Using Guardian and Enscribe, the Tandem NonStop System ensures that all transactions are completed correctly even if a processor, I/O channel, disc controller or disc drive fails during that transaction. Equally important, the system downtime normally required for "restore" and "restart" operations is eliminated.

5. System Down—Software Failure. System software crashes are an important source of downtime in ordinary on-line systems, but not in Tandem installations. Because all Tandem software is designed and tested to run in a multiple processor environment, it is also designed and tested for failure modes never considered in single processor systems software. Most important, the use of independent processors, each with its own memory, assures that a software failure in one processor cannot cause a failure in a second processor or contaminate the data or programs executing in that processor.

6. System Down—Changing to a Larger Processor. On-line systems tend to grow, and as they grow they change. New applications, more stations, improved service; all of these result in a need for bigger, faster processors. With Tandem's NonStop System you can actually add processors, add memory, and add peripherals without any re-programming whatsoever. Using Guardian, Enscribe, and Envoy, Tandem's Data Communications method, all user programs and all files are geographically independent. They have to be for NonStop operation. You can also write your programs using a powerful high-level compiler for a multiple processor environment as easily as for a single processor.

7. System Up—Confidence Down. When an "on-line" system is up, people come to rely on it. And because today's computers are reliable, people have come to rely on them quite heavily. Which makes it even worse when the system does go down, or the information it supplies is wrong. Confidence is severely damaged. And anyone who has tried manual back-up systems knows that they are not the answer. An automatic back-up, non-stop system is the answer. And Tandem has it.

Intelligent Terminal: Defense Against Murphy's Law

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In more sophisticated terms, the suggestion has been made that Grosch's Law should be amended by a qualifier: "in a given state of the art." The microcomputer at the heart of the modern intelligent terminal certainly represents a new state of the art compared with the innards of the modern maxicomputer, and this goes a long way toward explaining why the intelligent terminal can win the cost-effectiveness battle.

What does the cost-effectiveness and the built-in versatility of the intelligent terminal mean in practical terms? It makes possible the installation of systems like this:

A multinational company offering a variety of materials handling and construction equipment serves its market through some 30 dealerships. The dealerships vary in size from operations in which the dealer stocks 5,000 parts and annually prepares some 200 service invoices, to dealerships which stock more than 25,000 parts and prepare more than 1,000 shop invoices.

The company is designing and installing an intelligent-terminal-based system which will give each dealer the level of equipment necessary to supply these services at the dealer's level of business:

- Parts Management. Recording of transactions against inventory, shipments made to customers, issues to work in process and stock replenishments.
- Service Management. Utilization and control of service labor and parts.
- Rental Management. Fleet utilization and profitability reporting.
- Accounts Receivable/Accounts Payable.
- General Ledger.
- Fixed Asset Accounting.
- Payroll and Management Information.

Automatic Transfer

Although the local intelligent terminals will be relatively self-sufficient, the system will provide for automatic transfer of parts availability inquiries and parts emergency orders between the dealer and the company's parts depot. It will also provide for data on parts to pass between dealers when the central depot is unable to fill a need. There will be no requirement for specialized operators or programmers on the dealer's payroll.

Now, what about Murphy's Law and the move to distributed processing? As systems get larger and more complex, Murphy's Law becomes more and more operative. For example, today's big operating systems (which direct traffic through the large computer) use up much of the maxicomputer's raw power. Their generality, which gives them the ability to do many things for the user, has also made them very complex, and complexity usually slows things down.

Classic Example

For another example, the large central computer site must act like a classic example of the job shop in a manufacturing environment. And all of a job shop's customers are always a little bit angry as the shop scheduler attempts to pilot the conflicting orders through the shop at the lowest cost possible without losing business. Things do "go wrong" in a large DP center.

What the end user, who is a devout believer in Murphy's Law, hopes to gain from a switch to distributed processing is more control and better economics.

More Control

The users want more control. We continue to hear that "management is unhappy" about data processing's performance. Users would like to be able to control when their work is done and how it is done. This includes not only data entry and DP production, but also system development, programming of production programs and the programming of special analyses and reports. The end users would like to be able to do more of these things themselves, calling in the DP specialists only when needed.

Economics Changing

The economics are changing. It is becoming economically feasible to give each manager the responsibility and the resources for his own DP operations. It is no longer really necessary to have a "large" central computer to which batches of work are carried. Systems based on a departmental terminal, an intelligent terminal that can work by itself or in conjunction with a larger computer, are here, are practical and in routine use.

Future Forecast

To sum up, the future of business DP lies with those who use the data, rather than with those who just process the data. The trend toward centralization of DP has been reversed, and within 10 years the bulk of DP will be done at end-user sites.

This forecast is based on three factors: a shift in cost-effectiveness of maxicomputers compared with the intelligent terminal, the growing trend to place computer power where it is needed most, and the administrative advantages of coupling the end user's ability to do a job with the user's responsibility to see that the job is done right.

LaVoie is vice-president of Sycor, Inc., Ann Arbor, Mich.

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Tandem offers a proven, field tested solution to the two principal questions everyone should ask about an "on-line" data base system: What level of service will it provide? What protection does it offer for my data base?

Someday all "on-line" systems will be NonStop. Tandem 16 Systems are NonStop today. And without price penalties. Not everyone needs an on-line, real-time, non-stop system, but for those who do there isn't another solution worth thinking about. Tandem Computers, Inc., 20605 Valley Green Drive, Cupertino, California 95014 or Tandem Computers GmbH, Bernerstrasse 50A, Frankfurt 56, West Germany.

Toll Free 800-538-9360 or 408-255-4800 in California.

Photo and schematic show three processor modules with space for fourth module, interconnected to disc controllers, tape controllers and communications controllers.

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The Tandem 16 NonStop System is composed of multiple, independent processors with dual redundant communications paths. The unique interaction between Tandem hardware and software assures not only continuous operation, and the integrity of your data base, but also throughput unmatched by any other computing system of comparable cost.

Distributed Systems Challenge DP Manager's Skills

(Continued from Page S/4)

- Simplify data processing functions.
- Give user groups access to software that is too expensive to develop in-house.

A consideration of the state of the art in the computer industry would take these general goals and restate them in terms of more concrete data processing objectives like:

- Decentralize corporate functions by implementing a distributed processing network.
- Replace general-purpose computers with cheaper minicomputers.
- Prepare the company to take advantage of new technology.
- Institute word processing and other automated office procedures.

In working out the actual implementation of a distributed processing system, the individual tasks involved would be decisions as to what functions to distribute and specifically how to distribute them. Many companies are already distributing some, if not all, of these functions:

- Printed output.
- Data entry.
- Data validation.
- On-line file inquiry.
- On-line file update.
- Program development.
- Program testing.
- Specialized services to specific interest groups.

The "what," however, often makes certain demands on the "how." As a result there are definite levels, or degrees of distributedness, depending on what function is being distributed. For example, four levels can be distinguished: distributed batch, I/O, distributed batch information processing, distributed interactive services and resource management.

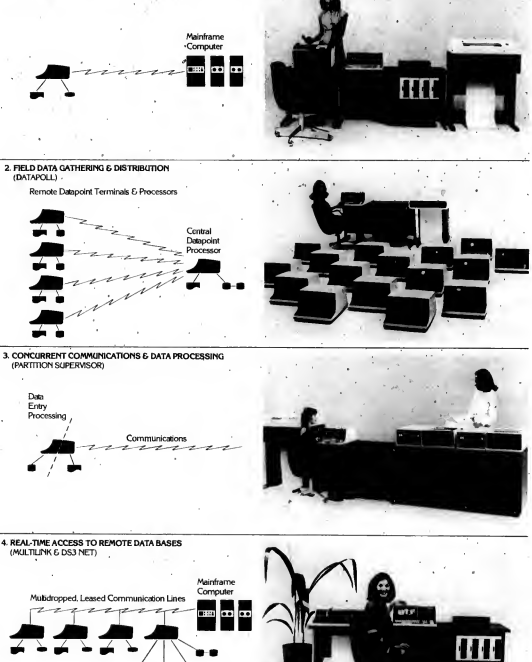
The first type of system seeks to distribute data collection (input) and printed output using intelligent terminals and remote batch terminals. This level has already been achieved by many companies.

The second type, distributed information, is more complex. The intelligent terminal has become a small business computer with its own operating system, programming languages, program libraries and files. However, in communication with other computers it still functions in a batch mode.

The third type, distributed services, attempts to give remote users a full range of computer services such as could be obtained from a large-scale computer system. The main difference between the second and third distributed systems is that communication between the computers is interactive rather than in batch.

The fourth type implies either a resource-managed network or an optimized distributed network. The intent is that users have access to all of the functions offered in the other three levels but with little or no duplication of resources. To achieve this, a network operating system is given the responsibility of allocating network resources in the most cost-effective way.

This article was written by the editorial staff of Auerbach Computer Technology Reports. The article is extracted from the Distributed Systems Reports, Auerbach Publishers, Inc., 6560 North Park Drive, Pennsauken, N.J. 08109.



Bank Saves Hardware Costs

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staff was only doing application-oriented jobs before, even if they were teleprocessing jobs. So, from a management point of view, you have to learn some new skills or relearn some old ones and it's difficult," he said.

Security Top Concern

In designing and developing the Bank of America system, security has been a top priority, and Ernst indicated the distributed processing approach has been advantageous as far as system security aspects are concerned.

Security begins at "the far end of the line" — the branch offices where terminals and a minicomputer are located. This intelligent system allows the bank to use encryption techniques at the branches, Ernst noted.

"Also, we are using modems, which allows us to do some rather unique things because we have microprocessing capability attached to the communications line. Now at the central site, using all the minis in the distributed processing system, we have perhaps two more gates or fences that we can put between the network of terminals and lines, which is perhaps the most vulnerable part of the system with respect to security problems," he said.

"We have two more control site fences that we would not have had in the former all-mainframe approach; namely, the minicomputers involve message switching and we can have security checks in the message switching front-end part of the minicomputer module."

Distributed processing may not be the answer for all banks, Ernst acknowledged, particularly those that are heavily dependent on vendor support. But for a large operation such as Bank of America, it can be the key to increased savings and better services, he concluded.

As Focal Point for Management

Distributed Systems Seen Strengthening Central Site

By Esther Surden
Of the CW Staff

CUPERTINO, Calif. — The heyday of distributed processing will begin in the early 1980s, but instead of the central site disappearing, it will grow stronger as a focal point for management, according to Lee L. Boysel, president of Four-Phase Systems, Inc.

Small systems, however, will be doing most of the processing in remote areas because of basic economic reasons, he stated in a recent interview here.

"A computer is a capital asset that competes with the added value of individuals," Boysel said. The only way any company can justify purchasing a system is if the cost of the system is less than the cost of the number of people to be replaced, he added.

By the early 1980's user conditions, combined with cost reductions in equipment, should set the stage for user implementation of distributed processing networks, he said.

Inefficiency Predicted

Traditionally remote sites have been served by dumb terminals, but by the 1980s these teletypewriters and CRTs will no longer be sufficient.

First, the dumb terminals transmit back to the mainframe on a character by character basis and so are inefficient. Next, the phone lines hooking the remote sites to the mainframe will not be able to handle more than 10% of the data that must be transmitted back to the mainframe. Last, the end user wants a tool to use daily that isn't dependent on the central mainframe.

He wants the terminals right at the transaction point and to be able to continue working even if the mainframe is down. The mainframe can then poll the system at night and generate the necessary reports for both management and the remote users, Boysel said.

The primary characteristic of the remote site is that it is labor intensive, he noted, with about $150 billion being spent on labor, wages and fringe benefits to people working in remote sites.

"If the computer industry can move into this area it can attack the labor costs," he stated, and "it is our belief that the growth of the total industry will be considerable."

"If users can improve productivity by 20% at 10% cost, the markets are absolutely staggering," he contended.

Once the cost comes down to the point that systems can increase productivity at less cost, users will be looking for long-term equipment investments, Boysel stated, because the people costs become prohibitive. Users think for a long time before they throw out a network of equipment if it means retraining, he said.

Costs Plummeting

Helping to move the industry into this area has been the development of LSI technology, which has brought the cost of a remote computing system from $10,000 or $15,000 monthly to $1,000 per month, and the cost per terminal from $700 or $800 monthly 10 years ago to $80 per month per terminal today, he said.

"When the relation between the people cost and the terminal cost is in the area of 20% of salary costs . . . the distributed processing market area begins to explode," he said.

Presently, four different kinds of companies are vying for the opening distributed processing arena, according to Boysel.

First, the companies with minicomputer and small business stand-alone machines in the $500 to $3,000 monthly price range are beginning to announce features designed for distributed processing. These companies are represented by IBM with the 3 and 32, Burroughs with the B80, Basic Four, Digital Equipment Corp., Data General Corp., Microdata and Hewlett-Packard, to name a few.

The classic key-to-disk systems also are gaining more capabilities and are moving into the distributed area. In clusters, these systems, represented by Pertec's CMC, Inforex, Mohawk, Data 100, Four-Phase and Entrex among others, cost about $1,000 or $2,000 monthly, according to Boysel.

On-line systems such as IBM's 3270/3790, plus others from Four-Phase, Raytheon, Computer Optics, Sanders and Couriers, also are moving into the distributed arena. These are also in the $1,000 to $2,000 monthly price range, Boysel noted.

Intelligent terminals are getting smarter, and systems such as those offered by Sycor, Datapoint and Incoterm will also be vying for users in the 1980s. These terminals cost about $200 to $500 per month, he said.

IBM can't be discounted as a contender for the user's attention, Boysel emphasized. It is in a "luxurious position," he added.

Data Communications is more than a Buzzword at Datapoint.

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Data communications is the critical link in Dispersed Data Processing. Without proven, flexible and compatible communications, a computer network can become just scattered hardware and a corporate liability.

Datapoint's leadership in dispersed data processing is due in large part to its broad range of communications hardware and software that provides the system planner with a tremendous range of flexibility in system design. This capability also assures the system user that data will be transferred easily and error-free.

These four areas illustrate ways in which Datapoint hardware and software combine to produce profit-making business processing systems:

1. Remote Batch Processing — Datapoint processors with associated peripherals, including card readers, printers and disk and tape storage units, provide a world of "intelligent" remote batch capability, capable of changing to different communications disciplines as required. Emulation routines are available for IBM HASP 360/20, 2780 and 3780 units, Honeywell GRTS, Univac DCT 2000, Control Data's UT 200 and Burrough's TC 500 terminals.

2. Field Data Gathering and Distribution — for the collection of business data from field locations. Datapoint's DATAPOLL communications packages make it possible for a centrally located Datapoint processor to poll other remotely located unattended Datapoint processors on an overnight basis over standard dialup telephone lines to take advantage of the lowest possible Datacom rates. Field equipment can include either stand-alone Datapoint intelligent terminals or processors. During the day, operators may use the keyboard and video display screen on these units for rapid, error-free data entry. This information is then stored on magnetic media until the optimum transmission time. DATAPOLL maintains full file compatibility between systems as the information is transferred.

3. Concurrent Communications and Processing — Under our sophisticated Partition Supervisor, a 5500 processor in a DATASHARE configuration can handle batch processing, communications and other "background" chores while simultaneously servicing up to 16 remote terminals. Users at these remote terminals can perform all necessary day-to-day interactive data entry and processing while batch needs are being met. This eliminates the need for expensive and time consuming shutdowns at local stations while batch processing or communications work is being handled.

4. Real-time Access to Remote Data Bases — Datapoint offers MULTILINK for real-time access to a host computer's data base. Under MULTILINK, Datapoint 1150 and 5500 stand-alone systems along a multi-drop communications line can perform all necessary local processing tasks, including intelligent data entry and report generation. When data is not available from the data base, the local processor can ask the mainframe for the desired information. 5500 DATASHARE systems may also be connected to the multi-drop lines, allowing users at each of up to 16 field stations full inquiry capabilities with the host mainframe. If the requested data is not available from the host computer, the host computer can request the information from the other processors on the line. This data transfer can occur totally transparent to the user.

For communications with a Datapoint DATASHARE system, another Datapoint software package, DS3NET, enables field office users of Diskette 1100, 1150, 2200 and 5500 systems to access data files in a host DATASHARE system as well as the files on their own local data base. This alleviates the need for costly and time consuming physical transfer of these files from storage unit to storage unit. DS3NET makes it possible to establish a true corporate wide data base without having to physically deposit files in a central storage unit, relieving a substantial burden on data communications capacity.

With this kind of data communications capability, you'll find that Datapoint equipment is hard to beat for efficient and error-free fulfillment of all of a company's communications needs. The Datapoint commitment to data communications reflects its overall analysis of what business users need to build profitable data networks. With its lengthy lead in dispersed processing technology, Datapoint is in an excellent position to help you out with your expanding computer network and data communications needs. For more information contact the sales office nearest you or Marketing Communications, Datapoint Corporation, San Antonio, Texas 78284.

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Minis Make Distributed System Economically Feasible

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becomes overloaded.

At a given point, the user who is relying on a centralized system, and whose computing needs are increasing steadily, will probably pose the question, "Should I consider implementing a distributed system?" The next question will be, "Why should I even consider making such a move?"

The first consideration is a geographic one. Sharing computer resources by users at remotely located sites has been a major impetus for the development of network technology.

Generally, users can be categorized into one of two distinct classes. The first is where growing factories or office complexes may be joined by user-installed, non-standard links up to a mile or two in length. The second class involves longer distances, such as those between offices in different cities, and requires the use of common carriers and standard interfaces.

One of the strongest motivations for replacing discrete batch-type computers with on-line networks is the provision of access to data bases in real-time. In the measurement and control market, such access can provide tighter and less centralized control over a process, thereby improving both productivity and plant safety.

For pure transaction applications, such as branch banking and credit authorization, access to common information improves security and reduces customer waiting time.

In recent years, the speed and capacity of minicomputers have been increased dramatically to a point where it is possible to compete with the smaller and even medium-sized members of some large computer families, such as the IBM 360/370 series.

Where an application has allowed the use of a mini, generally a much more favorable cost/performance ratio has been achieved than would otherwise have been the case.

Multiple minicomputers can provide the processing power of even larger mainframes, thereby greatly reducing hardware costs. To do this, the application must lend itself to segmentation, where the segments are processed simultaneously in different machines.

Reliability and availability of the computer is another factor of paramount importance in the consideration of a distributed system. In some applications, safety and/or economic considerations preclude toleration of a total system failure, even for short periods of time.

In these situations, redundant hardware has traditionally been specified as well as custom software to facilitate automatic switchover to the backup equipment. The extent to which these backup facilities are implemented is dictated primarily by the degree to which the system can tolerate degraded operation. In a distributed system, the temporary loss of one computer does not stop the rest of the network, and redundancy can be built in to insure that the load is picked up should one of the satellites go down.

In applications which require multiple computers, substantial cost savings can be achieved by uniting the computers in a network for the purpose of sharing peripheral devices.

Shareable peripherals may be divided into two major categories: unit record equipment and mass storage devices. The former class includes such devices as card readers, line printers, loggers and CRT terminals. These units may be infrequently used and are intended primarily to provide human interfaces to the system. The latter category includes magnetic tape and disk storage devices which contain current data base and archival information.

Sharing of mass storage peripherals permits files to be centralized on large units for cost reasons. They can be located at the point of most frequent access while providing general access to the network or duplicated on both centralized and distributed devices to achieve the above benefits plus data redundancy.

The overall technical capability which makes networking most feasible and desirable is the ready access by any user to resources located anywhere in the network.

What does it take, from a hardware and software standpoint, to implement a distributed system? Both hardware and software for fully distributed processing are available now, at reasonable costs, and developed to the point where distributed processing is an economically feasible alternative today.

Harple is president of Modular Computer Systems, Inc., Ft. Lauderdale, Fla.

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Railroad Builds Own Terminals

(Continued from Page S/14)

gramming techniques, he said.

So Jones ordered 80 of the Micronovas, configured with both synchronous and asynchronous communications boards, 8K bytes of read-only memory and 16K bytes of programmable read-only memory.

"We'll put the Micronova in a drawer, hook it to our existing communications net and rent 80 General Electric Terminet printers," he said.

"Basically, we'll build our own intelligent terminals with the features we want," he continued. "We will program the micros to be double-buffered so the biggest advantage [over the single-buffered Univacs] at first will be speed."

Initially, Jones will be replacing the DCT 1000s on a one-for-one basis and the Micronova-based terminals will function in exactly the same way as the older units.

Gradually, there will be things added, but on a program-by-program basis. "That's my idea of how a conversion should be handled," he added.

Programmers Will Become Obsolete

Eventually, there will be no need for programmers or dedicated operators out in the field, Jones said. The system will all be driven from the central site and any of the workers in the yards or sales offices will be able to use the terminals.

All the DG programs will be written in Cobol developed and tested centrally. Southern's goal is to down-line load the programs onto the micros and "we're confident we can do that.

"But that hasn't been a problem anyway," according to Jones. "The problem up 'til now has been the railroad's inability to put together exactly what it wanted. Now it can."

To illustrate the point, Jones noted he already has pinpointed some locations in which he is going to add CRTs to the terminals so the user can work with soft-copy output when hard copy isn't needed.

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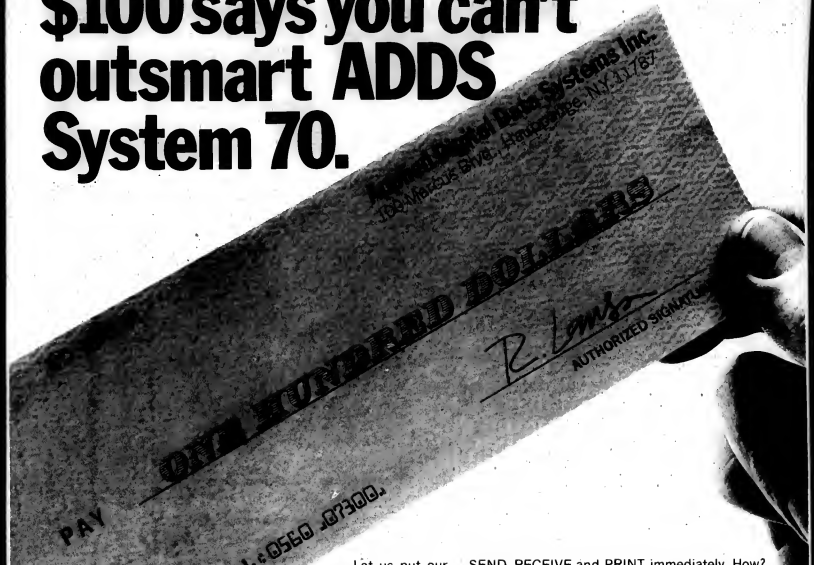

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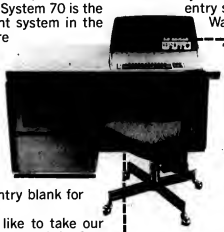

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Central Site Remains Active

Insurer's Distributed Net Retains Dual Mainframes

By Ronald A. Frank
Of the CW Staff

SAN RAFAEL, Calif. — At Fireman's Fund Insurance Co., the concept of distributed processing does not mean elimination of the mainframe capability.

The insurance firm is increasing the processing capabilities at its remote sites around the country, but it is doing so without relinquishing the control of the central DP staff located at corporate headquarters here, according to Ben Bevis, assistant vice-president in the computer services department.

49 Installations

Fireman's Fund selected Computer Automation, Inc.'s Syfa systems for installation at 49 branch offices by the end of this year. Five sites will have the minicomputer-based terminal-oriented systems installed by July, Bevis said.

In order to maintain control for the network at the firm's central DP site on the West Coast, the branch offices will depend on the headquarters site for key functions.

The remote sites will not have a compile capability and will be dependent on downstream loadings for major software changes. In addition, they will not be able to alter their equipment configurations without the proper approvals, Bevis explained.

Files Retained

Master account and other files for the insurance company will be retained in the firm's dual IBM 370/168s at the San Rafael central DP site.

Using interactive and batch transmissions on dial-up lines, the Syfa systems will interface with the mainframes to support local applications for data entry of client information and a "host interactive capability," he said.

A typical branch site will install a Syfa system including a 700-nsec processor with 128K of storage, two 176M-byte disks, a 600-line/min printer and five to eight CRT terminals.

Can Support 24 CRTs

Each configuration can support up to 24 CRTs depending on workload. The new systems will replace Four-Phase Systems, Inc. terminal-based configurations, Bevis said.

The choice of the Syfa systems includes a joint development effort with Fireman's Fund. CA will be responsible for all systems software while the customer will do the applications programming.

About three months' development time has been allocated for each application and much of the operator training will be done through interactive screen handling techniques, Bevis said.

Claims Indexing

One of the major applications will be claims indexing. This will include entering data on the insured, claimant, policy number, claim number and other needed information.

The claims indexing program and file will make it easier for operators at a branch to trace the status of claims when clients call in for information. The system will also handle mail requests and, for this purpose, a terminal will be placed in the mail receiving area where practical, he stated.

The claims indexing applications will provide a way to match up claimant with the insured on a particular claim. A building-block approach is being used in the software development so that the software can later be expanded, Bevis said.

Estimated Savings

The claims indexing application is estimated to save about $600 to $1,300 per month, depending on whether one or two operators are displaced by the system, Bevis said.

The claims indexing is now done manually by telephone using call directors, but the operators typically are shifted to other operations since there is always a way to justify the use of people so they are not fired, he added.

Other applications that contribute to the cost break of the Syfa systems are a draft issuance operation, which saves an estimated $700/mo, and the batch store-and-forward data entry system now running on the Four-Phase systems, which contributes about $1,100/mo.

The increased capability of the Syfa systems to handle multiple applications will save about $2,500/mo and this is the amount that the newer systems are costing the company, Bevis explained. A typical Syfa system costs about $95,000, but this does not include all overhead costs.

As more applications become operational on the systems, the savings will increase and the systems will become even more cost-effective, Bevis said.

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Concept of Distributed Data Base Readily Accepted

(Continued from Page S/12)

will have to be solved. For example, the DBA must specify the correct data content and logical organization for each user node; a method must be devised to direct all users to all data located around the network; and safeguards must be developed to ensure that all those requesting data are qualified.

The integrated corporate data base concept could be applied to support an organizationally distributed data base, as well as a centralized one. Furthermore, DP installations with a multivendor hardware policy may also take full advantage of the IC DB concept by logically centralizing the data bases of different vendors' processors into a single data base.

Storage Facilities

Storage facilities housing the data base should be designed to support a full range of storage and accessing requirements. This can be facilitated by using hierarchical secondary storage.

Different types of secondary storage media offering alternative access techniques and speeds at correspondingly adjusted costs would allow the DBA to specify and design the optimum physical storage configuration for the data base. By providing just four levels of hierarchy, an installation can capitalize on the unique requirements of individual users and save both time and money in the process of storing and transferring data.

Total System Efficiency

Total system efficiency depends largely on the specific organization of the data base. There can be only one physical representation of the data (random or sequential), and the DBA's choice as to which representation to employ is important if not critical.

The applications's view of the data (sometimes referred to as the logical representation) is equally important, inasmuch as the application modules of the user systems will be designed to utilize these representations. However, the amount of flexibility allowed in logical representation for applications depends almost entirely on the specific implementation of the DBMS.

Hunter is project editor for Auerbach Software Reports. This article is extracted from Auerbach Distributed Systems Reports, Auerbach Publishers, Inc., 6560 North Park Drive, Pennsauken, N.J. 08109.

Net Tracks Huge Inventory

(Continued from Page S/17)

estimate is that it takes a typical operator about an hour and a half to learn the unit and to be able to work at about the rate of an experienced operator," he said. "In the past our training periods had to be measured in weeks. The basic reason for this dramatic cutdown is the 'menus' that are programmed in the system to guide the operator through the various phases of conversion and other applications as well."

Programs for the Datashare systems have been written by an in-house programming group under the direction of Jack Faulhaber. Almost 100 separate programs have already been created for the systems and a number more are in the works.

"We find we can place more and more work on these units without overloading them," Wellman said. The basic language used for creation of these programs is also called Datashare. "It's easy to use, easy to maintain and easy to document," Faulhaber said, "which makes it ideal for the job shop work situation we have here."

Before installation of the terminal systems in the four warehouse facilities, Gulf Atlantic had relied on a totally manual recordkeeping system."The employee cost of the manual system was high," Wellman noted, "but an important hidden cost was the accentuated error rate that resulted and the time consumed in hunting down and correcting these errors."

The capability of the automated system has enabled Gulf Atlantic to reduce the number of clerical employees required to handle documents on movements for inventories stored in its facilities and to prepare billing information."We've reduced the clerical staff at the Arlington facility by 35%," Wellman noted; "and at our other locations from 10% to 20%. That magnitude of savings will in a short period of time more than pay for the units. And this doesn't take into account the much greater capability the systems give our management."

Wellman has indicated that in due course the units will also be used for such additional chores as scheduling of employees' work assignments, equipment maintenance, accounting and other local chores. "The independent processing power of the 5500s is such that we can use them for many different locally oriented reports, which can be extremely useful and profitable to us," he said.

The Datapoint systems, installed in stages, have been in use at Gulf Atlantic for almost three years. The plan is to bring additional systems into other warehouse facilities as soon as feasible.

"The units have been a big help to us in coping with the mass of detail we have to deal with," Faulhaber said. "It's also of note that they've been extremely reliable systems, presenting us with little downtime problems."

Missing Link Bridges Central, Remote Sites

(Continued from Page S/7)

is practical because equipment exists now to implement such arrangements. Independent vendors have long provided small programmable systems, and the major computer vendors are rapidly catching up.

But the chief advantage of distributed processing is also the major difficulty: providing branch personnel with more effective tools for more independent decision making. Putting more decision making capabilities in the hands of branch personnel requires a commitment from headquarters management to permit taking advantage of the new tools. The tools will be used.

If corporate management is unprepared for the new decision makers, they will get some surprises. Elimination of these surprises by being ready to accommodate more sophisticated and far-reaching operations at the remote site is the major challenge of distributed processing.

Reagan is managing editor of data communications at Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075.

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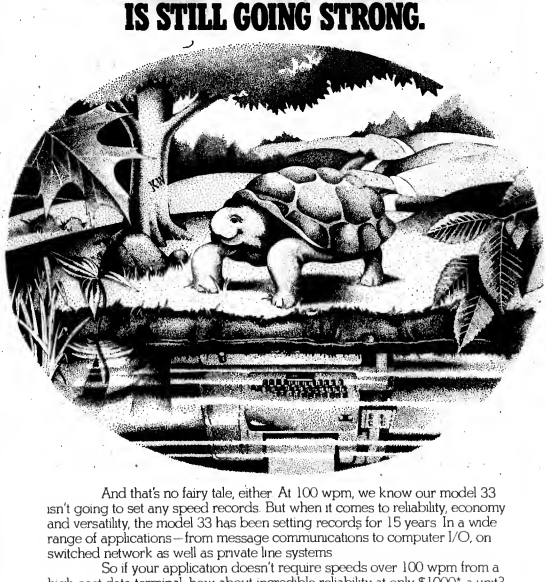

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Mini Bits

Ispa Seminar Set for Users Thinking of Distributed DP

NEW YORK — The Institute for Science and Public Affairs (Ispa) is conducting a seminar for DP managers, systems analysts and corporate management on developing minicomputer-based DP services within their own organization.

Entitled "Distributed Data Processing — What You Need to Know to Make the Vital Decisions," the seminar will be held in Boston on April 18-20; in Washington, D.C., April 27-29; and in Los Angeles, May 11-13.

The purpose of the course is to increase awareness of all aspects of distributed data processing; it will be especially beneficial to those who are thinking of moving to distributed processing, a spokesman said.

Registration costs $495 or $425 with a group rate of two or more. Additional information is available from Ispa Registrar, AMR International, Inc., 1370 Ave. of the Americas, New York, N.Y. 10019.

Floppy Controller/Interface Designed for Interdata Minis

WOODLAND HILLS, Calif. — BGL Technology Corp. has an IBM-compatible floppy disk drive controller/interface for Interdata minis.

The controller and interface are combined on a half-board and were designed around an MOS/LSI floppy controller chip, BGL said. With the board, single-sector reads and writes can be fully buffered, eliminating the need for a selector channel, a spokesman added.

The controller/interface handles one to eight Shugart SA800 or equivalent floppy disk drives, BGL said, and can be optionally configured to handle one to three Shugart SA400 minifloppy drives.

The controller/interface costs $895 from BGL at Suite 307, Warner Victory Center, 6355 Topanga Canyon Blvd., Woodland Hills, Calif. 91367.

Monolithic Has PDP-8 Memory

ENGLEWOOD, Colo. — Monolithic Systems Corp. has introduced an 8K-word, nonvolatile, add-on memory for the Digital Equipment Corp. PDP-8/A, -E, -F or -M.

A 4K-word configuration board is also available.

The plug-compatible memory in the 8K-word configuration requires .6A maximum at +5Vdc and provides the PDP-8 user with additional Omnibus slot space and power to drive peripherals, according to a spokesman.

The memory costs $995 from Monolithic at 14 Inverness Drive East, Englewood, Colo. 80110.

Operating System in Memory

HP Introduces Entry-Level 1000 System

PALO ALTO, Calif. — Hewlett-Packard Co. has introduced an entry-level member of its HP 1000 product line which has its operating system resident in main memory.

The system operates without a high-speed disk storage option.

Designed for automatic test control, manufacturing, automation and multiterminal laboratory computation applications, the HP 1000 Model 20 operates under the RTE-M operating system introduced with the product.

RTE-M is a multilingual, multiprogramming, real-time executive operating system. Since the operating system uses calls and file structure identical to the RTE-II and RTE-III operating systems used with the large 1000 series systems, upward compatibility of programs is assured.

Desk or Cabinet

Offered in either a desk-style or upright cabinet version, the Model 20 can accommodate up to 608K bytes of main semiconductor memory and can support concurrent program execution and program development on four or more terminals, according to a spokesman.

Program development for the system can be carried out in Basic only, he said, although the system will execute programs in Basic, Fortran or assembly language.

Mass storage for the system is a twin minicartridge drive. A floppy disk storage device, introduced with this system and available for all HP systems, can be added to the Model 20.

The 512K-byte floppy drive and controller has an average transfer rate of 46,000 byte/sec and an average access time of 267 msec.

Recording is double density on 67 track/disk, 30 sector/track and 256 byte/sector, the spokesman noted. Up to four floppy drives can be added to the Model 20.

Optional with the Model 20 and available with all other 1000 series members is a high-speed semiconductor memory that is said to increase the throughput capacity of the systems by as much as 30%.

The memory has a cycle time of 350 nsec and is configured on 16-pin 4K random-access memory chips.

The units are available in 32K byte modules, HP stated.

The desk-styled system costs $21,000. The cabinet model costs $22,000 for a 21MX E-series system with 64K bytes of MOS memory and 2645 CRT system console with two minicartridge disks.

The system includes Basic 1000M, Fortran and RTE-M operating system software.

The 32K-byte fast memory board costs $2,100 and the floppy disk drive costs $4,500.

HP is at 1501 Page Mill Road, Palo Alto, Calif. 94304.

HP 1000 Model 20 Desk-Style System

PDP-11/70 Users With Add-Ons Cite Lower Cost, Faster Delivery

By Esther Surden
Of the CW Staff

For a variety of reasons — from cost cutting to the vendor's long leadtimes on delivery — some Digital Equipment Corp. PDP-11/70 supermini users are turning to independent add-on memory for their systems.

Many vendors are offering add-on memories for the DEC systems, although all of these vendors are not represented in the users' comments below.

But what does come through is a user willingness to now try nonvendor memory in the minicomputer world — a phenomenon formerly reserved for the realm of mainframers.

"It's faster, it's cheaper and it works better" than the DEC memory, Mike Gilford, vice-president of S&H Information Systems in New York, said about the 500K bytes of Fabri-Tek add-on memory he has on his PDP-11/70.

S&H, which does on-line graphics and engineering work, is "satisfied" with the decision made last July to go with the independent memory, Gilford said.

The Services Management Group of New York's Citibank is another add-on memory user.

"The primary reason I bought it was I needed memory in a hurry and it was the fastest delivery I could get," according to Fred Wabnik, a systems officer.

The memory was delivered quickly. "It worked fine and I'm pleased with it," he reported.

Wabnik is using 256K words of DEC memory and 256K words of Ampex Corp. add-on core.

Kim A. Sheridan, president of Interactive Information Systems, Inc. in Cincinnati, uses Intel Corp.'s solid-state add-on memory on its in-house 11/70.

The firm, a systems house specializing in applications for distributors, chose the memory because of its error-correction coding and likes its reliability and low cost, Sheridan said.

American Health Systems, a California-based systems house/facilities management firm, put Fabri-Tek add-on memory on two of its PDP-11/70 installations because "DEC deliveries drove us to it," James Gardner, vice-president and treasurer, said.

"We would not have normally gone this route," he explained, but having been forced into the situation, "we've had good luck with it."

The memory has been reliable, not requiring service or patches, and was cheaper, he noted.

"Having gone this way and taken the risk, we will not be buying large amounts of memory from DEC any longer," he said.

The Domain Specific Systems Research Group at the Massachusetts Institute of

(Continued on Page 50)

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Mini-Based Graphics System Turns Data Into Images

By Esther Surden
Of the CW Staff

CLEVELAND — It's difficult to picture the stresses on a supersonic airplane in flight or visualize automobile traffic patterns.

But a minicomputer-based graphics system at Case Western Reserve University here has been interfaced to a movie camera to produce films of just such things, according to Frederic Parke, assistant professor in the Department of Computer Engineering and Information Sciences.

"It isn't always possible for everyone who wants to see the results of certain data to come to the place where the images are output," Parke explained, so the university produced the software for a custom-designed graphics system from Evans and Sutherland to allow the system to record data on camera.

The system can produce animated images, turn them in any direction, color them and record the finished product on film.

In one case, the National Aeronautics and Space Administration used the system to produce a motion picture illustrating the stresses on a supersonic aircraft in flight. In another, the Case Reserve Mathematics Department is using the system to illustrate automobile traffic patterns that formerly could be described only in numbers, Parke said.

Based on a Digital Equipment Corp. PDP-11/40 mini, the system is programmed primarily in Algol, he noted. Some users do use Fortran or Assembly language, he added.

Programming for the system is mainly performed on another minicomputer — a Texas Instruments 980 text-editing and file system with a 100M byte disk. It is connected to the PDP-11/40 over a 9,600 bit/sec RS-232 link.

The Algol compiler for the system was developed at Case by a graduate student. The software needed to run the animation camera wasn't too difficult, Parke indicated. Changes to a few Algol commands were necessary so the program would allow the film to be advanced one frame.

For color film, the commands had to be changed so different filters could be used to create the combined color picture, he said.

The system conceives all drawings in basic units of polygons. It turns or cuts these polygons to form any shape and it can create 30 image/sec for animated sequences.

Mathematical descriptions and sets of points can be entered into the system via the keyboard, but two-dimensional data can be entered through a large dual-pen data tablet, Parke said. With the tablet, users can draw designs and watch their progress on a CRT.

Users usually work with the graphics system themselves, Parke pointed out, because the department is unable to offer programming services. Sometimes the professors will arrange for graduate students to do their programming for them, but for the most part the user interface is easily mastered, he said.

The easily mastered user-machine interface was a goal of the system, Parke noted, and most of the work presently being carried out is oriented toward making the system more accessible to people.

"There are other systems which are more specialized or more powerful for certain tasks, but this is the only general-purpose, interactive, shaded graphics facility we know of," he said.

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Changeover to In-House Mini Makes Accountants' Lives Easier

HOUSTON — A small business system at an accounting firm has made life easier for the certified public accountants (CPA), according to Janie Nathans, a partner at Nathans and Nathans here.

The firm had long been unhappy with the turnaround time on reports from a local service bureau, Nathans recalled, and decided to purchase an in-house minicomputer for client accounting, payroll accounts receivable and business tax returns.

The partners looked at systems from Litton Industries, Digital Equipment Corp. and NCR, but rejected them in favor of a Dallas-based firm called Warrex Computer Corp.

Nathans admitted being skeptical at first of purchasing a system from a relatively unknown company, but said she met everyone from the chairman of the board on down before she was finally sold on it.

The accounting firm also liked the system because it offered fixed disks rather than floppy disks, as the other systems did. "We felt the fixed disks would be easier to work with," she explained.

The configuration at Nathans includes a Centurion II system with 20K of memory, 10.4M bytes of disks, a 175 char./sec printer and a CRT. It cost about $30,000.

Software and training as well as maintenance service are taken care of by the local dealer. "Maintenance and service have been very good. Whenever we've had a problem, the engineer has been right over and fixed it," Nathans said.

The system performs all accounting processing for clients including financial statements, general ledger, supporting schedules, payrolls, business tax schedules and accounts receivable.

HP Cuts Price by 27% Of Lab Automation System

PALO ALTO, Calif. — Hewlett-Packard Co. has reduced the price of its minicomputer-based HP 3351A laboratory automation system by 27%.

The price change from $13,750 to $10,000 was the result of improved manufacturing techniques and a reduction in the cost of semiconductor memory, according to the firm.

The data system enables chromatographers to add data handling and analysis capability to digital or analog output gas and liquid chromatographs, HP noted from 1501 Page Mill Road, Palo Alto, Calif. 94304.

Financial Calculator Bows

DETROIT — Burroughs Corp.'s C 6453 financial calculator provides three interchangeable program activator panels which fit over the program selector keys for flexibility of program selection, the company said.

The stored programs provide solutions for installment, commercial and mortgage loans. Other applications include calculation of compound interest of savings deposits, redemption of certificates of deposit, individual retirement accounts, annuities and amortization schedules.

Purchase price is $795 from Burroughs, Detroit, Mich. 48232.

93 Minis Help Speed Weather Forecasting

ROCKVILLE, Md. — The National Weather Service is using 93 minicomputers to help turn information from balloon-borne instruments into measurements of temperature, pressure, humidity and wind to be used in forecasting.

The result: The service can now do in two hours what two people previously needed four hours to do, according to William Taylor, a systems analyst.

The minicomputers are Data General Corp. 1220s configured in a turnkey system from Daconics of Sunnyvale, Calif. They were chosen after the weather service went out on bid for the systems.

The minis are located at the 93 Commerce Department weather service stations located at grid points 80 nautical miles square, Taylor said. They have been credited with speeding up the conversion of data received from the balloons while reducing errors by 50% compared with the all-manual technique.

Accurate measurements of weather conditions from the ground to high in the atmosphere are obtained by radiosondes carried aloft by balloons filled with helium or hydrogen. Each radiosonde consists of a lightweight box containing meteorological instruments linked to a small radio transmitter.

As the balloon rises, telemetered information from the radiosonde is continuously received by a ground receiving and tracking station. The weather data received is processed by the mini to give information on temperature, pressure and relative humidity.

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Revamp of Lockheed System III Brings Price Reduction of 20%

System III Model A

PLAINFIELD, N.J. — Lockheed Electronics Co.,Inc. has restructured its small business system product line and effected a 20% price reduction.

The Lockheed System III is now available in two basic models — A and B.

The System III Model A, in the range of the IBM 32, consists of a single serial 1,920-character CRT, 32K bytes of semiconductor memory, 5M bytes of mass storage and a 165 char./sec printer. It costs $29,950.

Model B

The Model B, in the range of the IBM 3, includes 65K bytes of semiconductor memory, 10M bytes of disk and a 300 line/min printer. It costs $49,950.

Both models include a multitasking operating system, RPG-II and IBM 3 program and data conversion software.

Industry application programs for insurance agents and brokers, medical services and a general accounting package are currently available, a spokesman added.

The Model A is upwardly expandable to the B and each system can accommodate up to eight terminals, the firm said.

Additional disk can also be added to the systems, the spokesman noted from the company in Plainfield, N.J. 07061.

EMM Has PDP-11/70 Add-Ons

HAWTHORNE, Calif. — Electronic Memories and Magnetics Corp. (EMM) has both a core and a semiconductor Digital Equipment Corp. PDP-11/70 add-on memory.

The Micromemory 7470 core and the 7670 NMOS memories are available in 128K-byte increments and can expand the PDP-11/70 to its maximum 4M-byte capacity, EMM said.

Only two cabinets are necessary for the expansion to 4M bytes.

The NMOS memory has a 500 nsec cycle time while the core version is "23% faster than DEC memory," EMM claimed.

Both memory systems include the memory cards, chassis, power supply, cooling fans and a controller.

The basic 128K-byte Micromemory system costs $11,750 while the 1M-byte system costs $48,000, EMM said from 12621 Chadron Ave., Hawthorne, Calif. 90250.

Standard Register Adds Supplies

DAYTON, Ohio — The Standard Register Co. has introduced Certipak, a line of small business system and word-processing supplies such as magnetic cards, tape cassettes and flexible disks.

The magnetic cards are compatible with those made by IBM, Xerox, Redactron, A.B. Dick, Omnitext, Sperry Remington and others, a spokesman said. They are packed 25 to a box which doubles as a storage container and are certified to be error-free, the firm said.

A variety of configurations are available, making Certipak compatible with the equipment requirements of most disk drive manufacturers, the firm claimed.

The cards cost $15 per box, the cassettes cost $6.95 and the disks cost $6.50 from Special Products, P.O. Box 1167, Dayton, Ohio 45401.

Datapoint Datashare Uses 20M-Byte Disk

SAN ANTONIO, Texas — Datapoint Corp. has added another system to its Datashare line of small time-sharing systems.

The 4530 system uses a 20M-byte disk drive with 10M bytes of fixed and 10M bytes of removable disk. With a 40M-byte Model 9376 extension unit, the system can accommodate up to 160M bytes of disk storage, the firm said.

Desk Console

The disk drive fits into the Datashare desk console. The 4530 includes the firm's 5500 processor, the 20M-byte disk drive, multiport adapter for communications with the user workstations, a voltage regulator and operating software, the firm said.

The unit costs $36,586 or can be leased for $852/mo. User workstations cost $126, Datapoint said from 9725 Datapoint Drive, San Antonio, Texas 78284.

County Governments Get Turnkey Option

MOLINE, Ill. — Fidlar & Chambers has a turnkey minicomputer designed to serve county governments.

Based on the Data General Corp. Nova 3 minicomputer, the Computerized On-Line Governmental Services (COGS) system includes programs for election offices, assessors, tax-collecting departments and local government management, the firm said.

For Budgeting

The government management package also offers programs for payroll, accounting, inventory control and budgeting, a spokesman noted.

The system includes a CPU with 32K of memory, 10M bytes of disk, a dual floppy drive and either a Centronics or Data General printer operating at 165- to 825 char./sec.

COGS costs $60,000 to $70,000 including all software, Fidlar & Chambers said from its Governmental Services Division, Box 220, 1415 Fifth Ave., Moline, Ill. 61265.

Upkeep Offered in N.Y.

HOLMDEL, N.J. — Third-party maintenance of minicomputers, minicomputer peripherals and data entry terminals is available in the New York area from Total Tec, P.O. Box 262, Holmdel, N.J. 07733.

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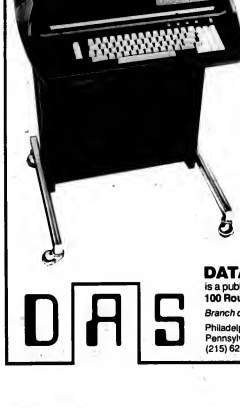

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With Mini, Food Processor No Longer in a Pickle

PORTLAND, Ore. — For the first time in years, Steinfeld's cucumber report is on time, thanks to a desktop minicomputer system.

Steinfeld's Products is a food processing firm here that specializes in manufacturing pickles and sauerkraut under the brand name of "Steinfeld's Western Acres" and for various private labels.

According to Marvin Wierima, secretary-treasurer, Steinfeld's Products has steadily enlarged and improved its production facilities while increasing the clerical staff by only one.

By 1976, almost all accounting, inventory and payroll operations were still being done by hand — resulting in an increasing number of delays and errors as the work burden increased.

Unusual Problems

Food processors like Steinfeld's face an unusual set of problems in both inventory control and accounting, Wierima explained. For example, all of the raw materials are perishable, subject to spoilage and mold within a relatively short time. For that reason, cucumbers and cabbages must be purchased seasonally.

They must also be brought in, sorted, pickled and some packed in less than 24 hours. Purchasing, inventory control and production scheduling therefore have the highest priorities.

During the summer months, an increase in paperwork is unavoidable because of the limited harvest time of raw perishable products. Inventory control must keep complete records by grade and, more importantly, by date received.

A written inventory status statement, known affectionately as the "cucumber report," provides individuals throughout the company with updated inventory data for production scheduling.

Because of the seasonal nature of the operation, Steinfeld's supplements its labor force during harvest time with temporary help, swelling the company's rolls from 85 to 140 employees. Earnings and tax information for each of these new employees must be recorded.

An additional problem is order size. Steinfeld's must market its manufactured products through numerous small orders.

This multiplication in number of orders, in addition to the increased paperwork from a larger work force, finally began to show in the performance of the general office's six employees.

By 1976, they were receiving 36 orders each day — requiring an equal number of hand-written invoices and file records. The cucumber report, essential to productive planning, was appearing two to three days late.

Procedures Studied

To help them find a solution to the growing problem, Steinfeld engaged a management consultant, Richard L. Ferris Associates, to make a study of Steinfeld's recordkeeping procedures. The consultant recommended the purchase of an in-house DP system.

"We decided upon the Hewlett-Packard Co. 9830 desktop computing system because it met our criteria better than any other available system. It is flexible enough to do all our order processing as well as statistics and specialized food processing programs," Wierima said.

"The fact that it can be expanded up to 32K memory, uses a high-level programming language and will accept two 6M-byte disk drives made it possible for us to use our more complex food processor programs without worrying about running out of memory," he added.

Software and programmability were other major concerns, he said, but "HP has an order processing system for the 9830 that contains order entry invoicing, inventory control and accounts receivable modules. These not only fulfill some of our business needs, but also are a good foundation for developing custom programs.

"We needed a system that would be both easy to program and easy to use by operators with limited experience. HP helped by offering training classes in both 9830 operation and programming," he noted.

Steinfeld's purchased the unit last April. A software consultant was hired to modify HP software and to develop some specialized programs.

At the same time, Wierima attended programming classes and Marie Schaeffer, the employee who operates the machine, attended operating classes.

By July, payroll, order entry and cucumber purchases were in operation.

Since then, the clerical time required for the general office staff has been cut by 10%, Wierima said.

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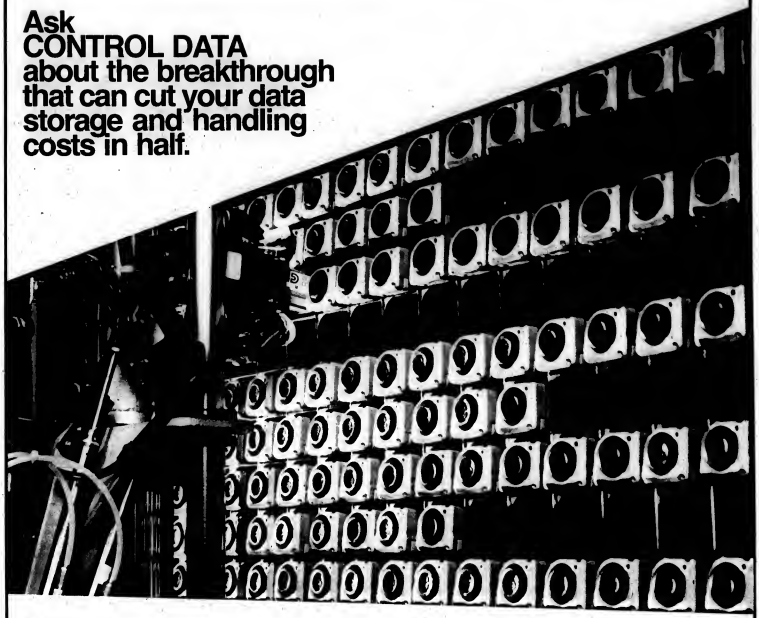

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Hierarchical Distributed Minis Predicted Pattern of the Future

By Esther Surden
Of the CW Staff

SANTA CLARA, Calif. — In the future, dedicated minicomputers will be handling tasks such as order entry, stock control, industrial automation and word processing. Each of these minis will communicate to a larger mini at a branch, which in turn will send the final data to a mainframe.

This is the scenario of Bill Krause, marketing manager for Hewlett-Packard Co.'s General Systems Division.

The hierarchical way of distributing computing suits most business structures, Krause said in an interview here recently, so the logical extension of this is something out in the branches sending information to the home office.

Remote job entry terminals were doing this function for a long time — and doing it well — but users needed more functions and some editing done before the data went to the mainframe, he said.

Other systems came along to do the data entry and editing functions, and they also performed their functions well, he said. The move of the future, however, will be away from just data entry to full data base management and local storage at a user's plant, he predicted.

But even this capability will not be enough, he noted, because users will want to get closer to the data. Smaller but dedicated minis will therefore crop up in individual departments associated with a business to control specific applications.

The hardware necessary to do the job is already here, Krause contended. The large minicomputer at the remote plant is, in effect, today's superminit; the individual minis dedicated to specific applications are today's general-purpose systems.

Prices may come down and hardware may be modified, but the basic systems are available, he indicated.

Much has to be done on the level of software, however, Krause said. Systems able to function in this manner need a good multiprogramming operating system, the ability to handle a variety of languages, data base management capabilities and data communications capacity.

Of these four areas, data communications is the most crucial and needs the most work, he said. HP is working on this aspect of its product line to make its systems fit more easily into a mold for the future, he said.

Utility Packages

A special report in the April 25th *Computerworld*.

Whether you're sorting, spooling, writing, reporting, managing, maintaining, securing, capturing, manipulating or preparing data — you've probably used (or thought about using) one of the multitude of utility packages currently available.

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PDP-11 Users Cite Savings With Add-Ons

(Continued from Page 45)

Technology in Cambridge, Mass., is using 128K of Standard Memories, Inc. core on its 11/70.

The system is used for both time-sharing and support for developing software for real-time applications of specialized machines and microprocessors, according to Peter Jessel, research associate.

The group needed more memory on its system and talked to Intel, Fabri-Tek, Ampex and Harris as well as Standard Memories. Standard Memories was chosen because its memory cost about a third of DEC's price and it "could deliver," Jessel said.

"Once we went in with Standard and were happy, we lost interest in looking at other add-on memories," he noted.

Digital Management Corp., which runs a data base management time-sharing system on its DEC PDP-11/70, added 128K bytes of Ampex memory to its 192K of DEC memory.

The firm went to the independent memory, according to Doug Kammerer, manager of operations and technical services, because "it was cheaper and we could get it much sooner."

Woody Woodward of United Computing Systems, a user who has tried both Standard Memories core and Intel solid-state add-on memories, said the Intel memory is smaller and more maintainable than the Standard Memories unit.

The firm went to independent memory when DEC couldn't supply it quickly enough and would like to go "all independent," but DEC wouldn't service the mini if it thinks the trouble is "mongrel gear," the maintenance engineer said.

The company reported some problems with the initial Standard Memories unit, "but I'm sure by now [it has] the bugs out. The cage was bulky and the boards were big and bulky," he said.

"With Intel, when you want to change something, you pop out a chip. With the Standard Memories, you had to keep spare boards onboard," he added.

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School Trades IBM 3/10 for Eclipse to Gain Flexibility

CAYEY, Puerto Rico — Cayey College here has replaced its IBM 3/10 system with a Data General Corp. Eclipse minicomputer to allow the school more flexibility, according to Mariano Garcia, director of the college's computer center.

"Our decision to look for a new system was based on the need for more computing power, a specific need for a tape drive to interchange information with other computer centers in the areas of admissions and transfers and a desire to provide computer-assisted instruction (CAI) to the students," he said.

The mini is used to handle the school's administrative tasks including admissions and registration, financial aid, accounting and budget analysis and reports.

In addition, the school uses the system to teach two sections of Cobol and one section of Basic. A CAI program called Copilot is being used by about 100 students enrolled in freshman English, Garcia said.

Both the administrative and educational applications are performed concurrently.

On-Line Maintenance

The IBM 3 was doing student records, financial aid, admissions transfers and daily checks and accounting. "The new system is taking the daily checks and accounting on-line so we can give the student master file on-line maintenance," Garcia said.

Before going with the Eclipse system, the school considered proposals from IBM, Burroughs, DG and Digital Equipment Corp. "The Eclipse was chosen on the basis of cost," he said.

Fairly Easy Conversion

Converting to the Eclipse from the IBM 3 was not considered a "critical factor since we thought conversion would not be difficult," he added. Converting turned out to be fairly easy, he said.

The school had been paying over $3,000/mo to lease the IBM 3. The Eclipse system will pay for itself, based on this figure, in less than four years, Garcia said.

The system installed includes a C/300 with 165K bytes of memory, a 25M-byte disk, 300 line/min printer, card reader, magnetic tape unit, four teletypewriters and four CRTs. The CRTs are located in administrative areas and the teletypewriters are used for classroom work.

CAI Boosts Students' Flagging Interest in Math

By Stanley A. Crane
Special to Computerworld

GARDEN CITY, Kan. — A minicomputer-based, computer-assisted instruction (CAI) program at Garden City High School here has been credited with increasing enrollment in mathematics classes by 20%.

The program takes advantage of the system's ability to give individualized career-oriented mathematics instruction.

Called Project Master, the program is made possible through a three-year Title IV ESEA grant. The project, under the direction of James F. Kientz, has been in operation since February 1976.

The program is built around a Digital Equipment Corp. PDP-11/10 with multiuser Basic, RT-11 and 18 specially designed alphanumeric keypads for student input. The keypads are multiplexed into the system to make it possible to use a smaller system-and operating system than normally thought possible.

650 Student Users

Presently the system is used by 650 students enrolled in 28 algebra, trigonometry, physics, chemistry, business math, geometry and occupational math classes. Math problems are coded into the computer depending upon subject, topic, career application and difficulty.

Photo by Jim Correll

Students at Garden City High work out class problems.

Students may request a set of questions pertaining to a recently covered topic in class, with the questions applying to that particular student's career interest and ability.

Besides the 6,000 problems available to students, there are 130 simulations of real-life situations that students may use via six conventional terminals.

The most evident effect of Project Master in Garden City High School has been an increase of 20% in the mathematics classes; enrollment for four of the five years had decreased an average of 13% each year.

The result of the project on students in the school will be statistically measured this year with an extensive set of tests designed to measure attitude, computational ability and organizational ability, in addition to a standardized test.

Crane is systems manager with Project Master at Garden City High School.

CA Has Analog I/O Systems

IRVINE, Calif. — Computer Automation, Inc. (CA) has a series of 17 analog input/output systems for its LSI family of minicomputers.

Each system is packaged on a single half-card and operates from the standard chassis power supply, the firm said.

The top-of-the-line 12-bit unit can process up to 64 channels of analog data at a throughput rate of 35,000 channel/sec, the company claimed. It costs $2,275 from the firm at 18651 Von Karman, Irvine, Calif. 92713.

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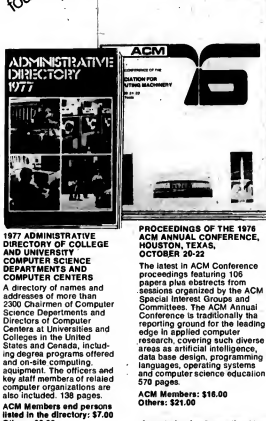

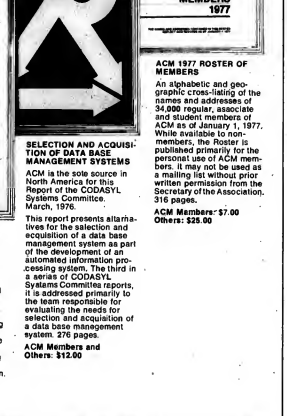

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A directory of names and addresses of more than 2300 Chairmen of Computer Science Departments and Directors of Computer Centers at Universities and Colleges in the United States and Canada, including degree programs offered and on-site computing equipment. The officers and key staff members of related computer organizations are also included. 138 pages.

ACM Members and persons listed in the directory: $7.00
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The latest in ACM Conference proceedings featuring 106 papers plus abstracts from sessions organized by the ACM Special Interest Groups and Committees. The ACM Annual Conference is traditionally the reporting ground for the leading edge in applied computer research, covering such diverse areas as artificial intelligence, data base design, programming languages, operating systems and computer science education. 570 pages.

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SELECTION AND ACQUISITION OF DATA BASE MANAGEMENT SYSTEMS

ACM is the sole source in North America for this Report of the CODASYL Systems Committee. March, 1976.

This report presents alternatives for the selection and acquisition of a data base management system as part of the development of an automated information processing system. The third in a series of CODASYL Systems Committee reports, it is addressed primarily to the team responsible for evaluating the needs for selection and acquisition of a data base management system. 276 pages.

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An alphabetic and geographic cross-listing of the names and addresses of 34,000 regular, associate and student members of ACM as of January 1, 1977. While available to non-members, the Roster is published primarily for the personal use of ACM members. It may not be used as a mailing list without prior written permission from the Secretary of the Association. 316 pages.

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COMPUTER INDUSTRY

CI Notes

Union Strike Halts Work At Three Burroughs Plants

DETROIT — Three Burroughs plants here remain closed as a result of a strike by the United Auto Workers in a dispute over a new contract.

The plants in Detroit, Plymouth and Wayne, which manufacture the B80, L series and printers, have been closed since the union's contract exp ired at midnight Feb. 28th.

The union is asking for improvements in wages and pensions as well as requesting that restriction on its cost-of-living clause be lifted.

Burroughs has made an offer for an increase in wages, "major improvements in benefits including life and health insurance, holidays, a dental plan and improvements in pensions," according to a Burroughs spokesman. The Burroughs offer also calls for a continuation of the cost-of-living allowance benefit, he noted.

The union, however, did not see the offer as fair and equitable and continues to strike, he said.

Univac Looks at Varian Data

IRVINE, Calif. — Univac has expressed interest in acquiring Varian Data Machines, according to a Varian spokesman.

The matter is being considered and a decision will be made following an assessment of the impact on the company, its employees and present and prospective customers, according to Varian Associates President Norman Parker.

Donal Duncan, Varian Data Machines president, said sales for the year to date are 15% above the same period last year and OEM sales have increased significantly.

Supershorts

Four-Phase Systems and Philips Data Systems of The Netherlands have extended, until Dec. 1979, their agreement under which Philips has been selling and maintaining Four-Phase products in Western Europe.

— —

Tri-Data Corp. has shipped its 5,000th Cartrifile tape system.

— —

Shugart Associates has signed an OEM agreemen with NV Philips Gloeilampen Fabrieken of Eindhoven, The Netherlands, which enables all Philips manufacturing groups to purchase Shugart products.

Annual Growth Rate Over 110%

CSI Predicts Bright Future for Micros

By Toni Wiseman
Of the CW Staff

SAN JOSE, Calif. — Starting from essentially zero in 1973, the installed base of microcomputers will reach 60 million units by the end of 1980, an annual growth rate of over 110%.

This growth in unit sales will accelerate even faster after 1980 as many consumer product manufacturers replace electromechanical controls with digital controls, according to a study by Creative Strategies, Inc. (CSI).

According to CSI's definition, a microprocessor is "the central processing unit of a computer, fabricated on a single chip of silicon using large-scale integration technology and usually consisting of an accumulator, arithmetic unit, some memory, a program counter, instruction decoder, address register, timing section, data input and output controls and data bus.

"A microcomputer consists of one or more microprocessors and whatever added LSI components are required to produce a functioning computer such as added memory, clocks, etc."

The microcomputer market to date has been dominated by Intel and its 8080 has become the de facto industry standard for general-purpose 8-bit devices, CSI said.

In 1975, the 8-bit machine accounted for about 37% of the market. This share grew to 50% in 1976 But is expected to decline to about 45% by 1980, according to the report.

CSI further predicted that 4-bit microprocessors will decline from a 53% share in 1975 to only 10% by 1980 while 16-bit machines will grow from a 6% share in 1975 to 28% in 1980.

Free Processing Power

"By 1980 the cost of the microcomputer will be so low that processing power will essentially be free," CSI observed.

The great advantage of microprocessor-based machines is the flexibility they offer; programs can be changed by simply exchanging a single chip.

Any given function of a microcomputer could be performed by a discrete hardwired logic set which executes that single function, CSI said, but the importance of a microcomputer, in contrast to hard-wired logic, is that it is programmable to perform many different functions and drastically reduces the number of chips required.

"Although the microprocessor grew out of integrated circuit [IC] technology, the leaders in the microprocessor market are not necessarily those who lead in the general IC market.

"Many of the big IC manufacturers apparently underestimated the importance of the microprocessor and stayed out of the market or bet on the wrong technology and lost time," CSI said, adding the leaders in the field are well established and will not be displaced unless they make serious mistakes.

"The semiconductor industry is presently recovering from a serious slump which it experienced in 1974-1975," CSI said. But, "although the microprocessor is now the hottest item in the electronics industry, it will not lead the industry out of the doldrums, since it accounted for only 3% of the total sales volume in 1975.

"Microcomputers will, however, capture an increasing share of the total semiconductor sales dollars and will reach approximately 12% by the end of 1980," the report stated.

Intricate Economics

The economics of the microprocessor industry are intricate and of paramount importance to any competitor's success, CSI said.

It is especially true in the microprocessor industry that if a product is not first in the market, it must have some significant advantages if it is to survive, CSI remarked.

(Continued on Page 56)

Lease Accounting Change Hurt Memorex on the Books: Spitters

By Catherine Arnst
Of the CW Staff

NEW YORK — When a *Wall Street Journal* article reported in 1970 that Memorex Corp. was counting leasing transactions as sales, it stirred a controversy that changed the accounting methods used by the entire computer industry, according to Lawrence Spitters, founder and former chief executive officer of Memorex.

The method of accounting used was typical at the time, Spitters testified recently at the U.S. vs. IBM antitrust trial, and the Financial Accounting Standards Board approved of leases being tallied as sales if certain conditions were met.

But after the critical *Wall Street Journal* article and an investigation of Memorex by the Securities and Exchange Commission (SEC), the company could no longer add the income derived from leases to its net worth.

The result was that Memorex appeared to have a heavy burden of senior debt and, because it couldn't record its actual net worth, had difficulty in obtaining financing, Spitters said.

Eventually the accounting principles to which Memorex agreed evolved into standard practice with the issuance of "Accounting Practice Bulletin No. 27" on March 30, 1972. The bulletin stated that all risks of ownership must be transferred if a transaction is to be recorded as a sale.

The newspaper article was more concerned about Memorex's relation with its Independent Leasing Co. (ILC) than with the accounting methods used. ILC was created to give Memorex a cash flow to help finance its entry into the end-user market and to eventually provide Memorex with the large established lease base it needed to effectively compete with IBM in that market, Spitter said.

In 1970, Memorex solicited financing to establish ILC. ILC was set up as an independent company; Memorex was to have only 10% of the voting stock. ILC would purchase its equipment from Memorex with the understanding that Memorex would eventually reacquire the lease base.

ILC was incorporated in June, 1970, although the financing was not completed until March 1971. In the third and fourth quarters of 1970, Memorex sold leases on its equipment to ILC and began shipping that equipment.

The transactions were recorded as sales by Memorex and included as sales in the interim financial reports for those quarters, although no payments had been received at that point, Spitters said.

"It was the intention of Memorex to account for the sales to ILC as sales" because the profit obtained by this method would enhance the net worth of the company; he added.

After the article appeared, the New York Stock Exchange (NYSE) halted trading on

(Continued on Page 56)

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DP Dialogue

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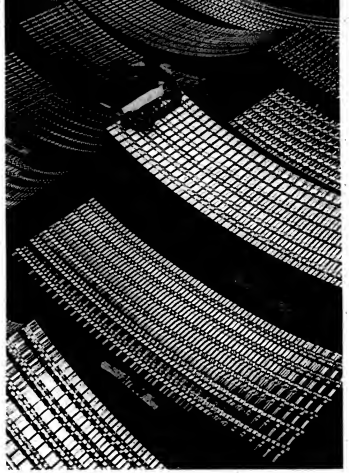

Centralizing DP Spreads Benefits for Wickes

At Behlen Manufacturing Company, a new manufacturing control system has enabled inventory reductions of 15 percent below projected levels and elimination of most backorders.

"Sales people can commit to delivery dates with confidence," says Warren Rood, director of manufacturing for the Columbus, Nebraska division of San Diego-based Wickes Corporation. "We are meeting our customer schedules like clockwork. Management can query any aspect of shop or inventory status, and the progress of any customer's order can be queried from terminals in Columbus."

"When we decided to set up an online system in Nebraska, we looked at the options," adds Nick Fergadis, director of management information systems for the parent company. "We could install a larger computer and staff up to implement the application. Or we could install terminals and draw on our corporate resources for both computing power and systems expertise.

"With similar decisions looming in other divisions of the company, we decided to centralize. We wanted the economies of supporting the corporation with one data center, using one IBM System/370, and with the professional talent we can assemble in a corporate group.

"Clearly, we could do a lot of things for our divisions that they couldn't afford individually."

These panels, assembled on the farm, form bins which store corn or wheat. Behlen Manufacturing Company makes agricultural equipment. The complete manufacturing control system is processed remotely on a System/370 Model 158 at the Wickes Corporation data center in Chicago.

Behlen makes prefabricated buildings, a wide variety of storage, handling and processing equipment for farms, and hydraulic machinery.

"About 30 percent of our production is job-shop work," says Rood, "either made to order or built to customer specifications, and this fabrication is fully integrated into the manufacture of our standard products. At any one time, we have about 14,000 shop orders open, and we control a total of 47,000 inventory items.

"Computer control is a must in an environment like this. We had a good bill of materials processing system and basic production control. But we wanted much more function—in particular, an online order entry and inquiry system to improve our responsiveness to the needs of our customers."

Today, Behlen uses the System/370 Model 158 at Wickes data center, in Chicago, accessed by seven terminals at the plant in Columbus, Nebraska: six IBM 3277 Display Stations and a diskette-oriented IBM 3776 Communication Terminal for entering batch work.

"Now," Rood says, "we're getting into some new areas of payoff, made possible by the centralized manufacturing control system. We are running studies of inventory movements, to see which older items we can take out of the product line. And the computer is helping us in physical distribution, guiding us in staging delivery items for optimum truck loading."

"For Wickes at the corporate level," Fergadis says, "one benefit has been a gain of in-house expertise in material requirements planning which can be transferred to other divisions."

MVS: Real Muscle for Large Systems

Processing a complex job stream makes unique demands on operating system software. And in a communications-oriented environment, the system must be able to handle large volumes of work in an unpredictable mix of batch tasks and terminal transactions.

Typically, a large system supports the mainstream operations of a company. To meet extremely high standards of availability, the system control program must be reliable and thoroughly tested. It must be flexible to permit frequent enhancements and revisions. Error recovery facilities must be complete and sophisticated.

OS/Multiple Virtual Storage (MVS) is the IBM system control program designed to meet these requirements. By providing a separate 16-megabyte virtual address space for each user, it presents a simplified environment and insures that no application can adversely affect any other. Error recovery facilities automatically accommodate most errors without involving the operator.

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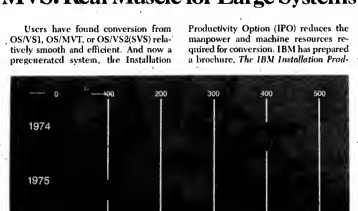

MVS has made more capacity available to users. The number of installations in the U.S. has risen rapidly, many with multiple CPU's.

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And the Attached Processor system is now proving its ability to significantly increase system throughput in such companies as John Hancock Mutual Life Insurance Company.

In Attached Processor and Multi-Processor configurations, MVS dispatches work on the basis of maximum efficiency and user-selected priorities. To the operator, the system is a single high-capacity processor. And the control program in a Multi-Processor configuration can isolate any portion of the system for maintenance—processor, memory segment, or peripheral—without affecting the rest of the system.

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Four-Phase Focusing on Distributed Networks of 1980

By Esther Surden
Of the CW Staff

CUPERTINO, Calif. — Four-Phase Systems, Inc. is a company in the distributed processing marketplace of the 1980s today, according to its president, Lee Boysel.

The firm — which until now has kept a very low profile — offers small distributed processing systems to Fortune 1,000 corporations, Boysel said.

The criterion for success in such a marketplace are "determined for the most part by the life expectancy of the product offered," he noted, a criteria Four-Phase feels its systems meet.

"It is a leased market and will continue to be so," he emphasized. Customers are interested in exercising some control over their vendor and a leased situation gives them more control.

In addition, the Fortune 1,000 companies are accustomed to dealing with IBM and other mainframers who lease their systems.

Customers in this area are reluctant to make hardware dollar commitments and, when they do, they are even more reluctant to throw out the old systems and put in new ones, Boysel said.

Given the character of the leased market, the longer any vendor's product is out in the field, the more successful the company, he said. While most companies estimate the lifetime of their systems at about five years, Boysel said the Four-Phase systems with their compatibility and upgradeability stay out in the field an average of seven to 10 years and "we account for five years."

'Not Next Xerox'

Four-Phase won't become the "next Xerox" because it plans to control its growth path, Boysel emphasized.

With distributed processing an estimated $500 million marketplace, all of the firms in contention are looking for 10%, or $50 million, of the market to be viable entities, he stated.

In order to get to that point, companies who lease systems generally need $25 million to $30 million in some kind of equity, $30 million to $40 million in bank debt and $25 million to $30 million in some other kind of financing.

"You need $100 million in cash just to get to the $50 million level where you have viability," he said.

Four-Phase, Boysel added, raised $28 million privately before it went public.

Abiding by the Curve

For most lease-based companies, a curve develops that determines the maximum growth rate for these firms, according to Boysel. "The maximum optimum growth rate is between 30% and 35% compounded annually. At between 15% and 20% compounded annually, the cash flow breaks even," he said.

The biggest danger for a company in this situation is to sell as much as it can, because the growth rate will always oscillate around the curve, he noted, and a firm not controlling its growth will find large dips in growth.

Four-Phase intends to abide by the curve and run the business "from end to beginning," its president said. The firm will predict the cash available, hire a specific number of salesmen and try to stay at a growth increase mark of about 30%, he said.

The next generation of distributed systems to be introduced by the company will "have the power of the IBM 145," Boysel said. Eventually, long lifetime in the market will require that systems have batch and on-line capabilities as well as transaction processing, word-processing, inquiry and many other capabilities, he predicted.

Focus for Salesmen

Four-Phase sells its systems through about 40 sales organizations, according to John M. Clark Jr., vice-president of marketing. The salesmen focus on limited but continuous coverage of assigned Fortune 1,000 companies.

"Every large user is interested in or is actively evaluating a program of distributed processing. The salesman's job is to show the companies how they can afford distributed processing and not lose control. . . .

"We deal primarily with the corporate DP operation" which is looking for a way for the remote user to send the large system clean information, he said. The DP department wants to get the "housekeeping out there where the user is responsible for it," he noted, so when the data is in the CPU it can be worked on quickly.

"The types of companies we deal with aren't interested in doing their general ledger and accounts receivable in remote locations," he stated.

In addition, Four-Phase wants "to get away from the idea of a computer in the outlying areas." Rather, the system should be transparent to the point that the users do not require computer skills.

"The user can turn the power on at the console and the system runs automatic diagnostics. If the red light goes on, he calls a field engineer and gets the system fixed," Clark said.

Four-Phase is a vertically integrated company that makes its own CPU and memory. At the time of its founding in 1969, "no other computer company was close to that level of integration," Boysel said.

"We gambled we could design an LSI computer" and the gamble paid off, he noted.

"This gave us at least a two- or three-year jump on the competition" and also allowed the firm to make a system with a unique design, he said.

Field service is handled primarily by Four-Phase with about 6% of it handled by outside sources such as Sorbus and Telex, according to Ron Garrison, vice-president of field engineering.

With 360 field engineers and an expected 460 by the end of the year, the firm keeps a careful eye on its maintenance organization with the motto that "field service equals customer satisfaction which equals continued revenues and corporate productivity," he said.

The firm surveys its customers to measure the maintenance program and performance.

The company claims a 99% system availability and a goal of a two-hour response time for maintenance calls.

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Eight Systems Coming From NCR

DAYTON, Ohio — Highlighting NCR Corp.'s increasing emphasis on mainframe systems, the firm said it will introduce eight additional new generation computer systems this year.

The additional models were designed to provide all sizes of DP users with easy upward migration and a choice of the type of processing best suited to their requirements, the firm said.

The releases will include additional NCR Criterion multiple virtual machines, interactive processing systems and multiprogramming systems. They will also include "dual-mode" models which permit a user to move from one type of operating mode to another without changes in applications software, according to NCR.

"This engineered migration capability and the additional computer models, including substantially more powerful systems; will enable NCR to offer a full range of general-purpose systems as the foundation for strong growth in computer revenues," chairman William S. Anderson said.

"They are designed to meet the future requirements not only of thousands of current NCR users but also new customers, including both entry-level users and those seeking new and more effective approaches to DP, he added.

Four systems will be unveiled next month and four in the fall, NCR said.

NCR's computer-related revenue — including equipment sales and rentals, income from field engineering, software and other supporting services, data center services and the sale of computer forms and other supplies — exceeded $1 billion last year.

The company has installed more than 6,500 mainframes and over 30,000 minicomputers, resulting in a doubling of DP revenues since 1972.

Change of Accounting for Leases Hurt Memorex Financial Picture

(Continued from Page 53)

Memorex stock for two and a half days, Spitters and other officers of the firm met with NYSE officials to explain the transactions.

The NYSE was satisfied with the explanation and reopened trading after Memorex issued a press release explaining its position, Spitters said.

SEC was not satisfied, however. The commission also requested that Memorex officials meet with it to explain the company's position.

Spitters had already consulted with Arthur Andersen & Co., an outside accounting firm, which agreed the methods Memorex used were appropriate.

An attempt was made to resolve whether Memorex or the SEC accounting staff was correct and "I felt Arthur Andersen was being subjected to pressure by SEC," Spitters said.

SEC asked the accounting firm for a written opinion which stated that the transactions were sales, but the accountants had great reservations, he said.

Memorex consulted Dr. Robert Sprause, a member of the Financial Accounting Standards Board, who prepared a letter stating that while all the attendant costs of a sale should be accounted for by Memorex, the net profits from these sales should be deferred over 48 months since a lessee, as ILC essentially was, does not assume all the risks of ownership.

The letter was "illogical" and contrary to standard accounting principles used by others in the industry, Spitters said. At that time, the point when most of the risks of ownership were transferred to the lessee was when a purchase should have been accounted for as a sale, he said.

Spitters testified that Arthur Andersen mainly wanted to satisfy the SEC and did not regard the paramount issue as one involving accounting principles. It warned Memorex that "you can't fight the government," Spitters said.

Consequently, Memorex capitulated and its 1970 annual report reflected the new accounting method. The report combined the debts of ILC and Memorex, but it eliminated deferred profits on Memorex's shipments to ILC as well as the realized portion of deferred profits and other shareholders equity (80%) in ILC earnings.

110% Annual Growth Seen in Micro Area

(Continued from Page 53)

"Microprocessors and memory chips are incredibly sophisticated and require some of the most precise and complex operations of any manufacturing process," the report said. "The completed chips will have undergone more than 100 discrete processing steps from the initial slicing of a silicone crystal through shipment."

Since manufacturing is a batch operation, the keys to low costs are the maximization of the number of devices per batch and the increase in the number of nondefective devices per batch.

A manufacturer can increase the number of devices per batch by increasing the size of the crystal wafer and/or decreasing the size of the die for each of the devices to be manufactured on a single slice, CSI indicated.

The industry standard from the late 1960s to 1972 was a 2-in. wafer, which was succeeded by a 3-in. wafer, the report said.

CSI predicted the 4-in. wafer will be common in 1977, representing a 5.6 times improvement over the 3-in. slice.

Although increasing use of semiautomatic equipment is improving the productivity of sort and assembly operations, much of the cost of this production phase is incurred by the use of hand labor, CSI noted. As a result, all U.S. semiconductor manufacturers have plants in low labor cost areas such as Mexico and Asia.

In 1975, eight U.S. firms competed for the microcomputer market: Intel, Rockwell, National Semiconductor, Advanced Micro Devices, RCA, General Instrument, Signetics and American Microsystems. At that time, Intel, National and Rockwell accounted for more than 90% of the sales.

In 1976 at least three major domestic, two European and five Japanese firms entered the arena, as well as several smaller firms, the report noted.

And, "unlike the general semiconductor market in which foreign competition shows up primarily in finished products rather than as components, U.S. manufacturers will find intense competition on the component level for microprocessors and associated chips," CSI warned.

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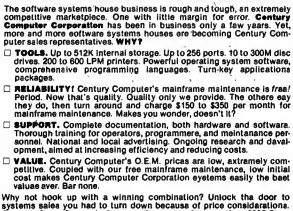

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IN **SYSTEMS**-HOUSES

Itel Sees Continued Profits In Batch and On-Line Services

By Molly Upton
Of the CW Staff

WHITE PLAINS, N.Y. — Itel Corp.'s Data Services Group expects its revenue mix to change from 65% batch and 35% on-line in 1976 to 25% batch and 75% on-line by 1981, according to President Bill Bird.

The transition should occur despite a targeted 15% annual growth in batch revenues, he added.

In addition, Itel expects to extend its practice of offering turnkey minicomputer systems to users in selected markets, he said.

Currently the firm has about 30 Data General Corp. minis installed at auto dealers through the Computer Dimension, Inc. facilities it acquired in Detroit. The Itel firm charges an ongoing fee to maintain the software.

Itel is planning to offer a similar service to accountants, Bird said.

Acquisition Route

The Itel data services venture started with the 1969 acquisition of a New York-based firm, Statistics for Management. In 1970, the firm began its quest for acquisitions to take it into new geographical markets and into on-line applications for certain specific industries.

Acquisition was the best route for the latter, Bird said, since firms in existence have already made mistakes and discovered the vagaries of the industries they serve.

To the acquired firms' expertise, Itel adds its forte of marketing and financing, he said.

Why expand in both areas? "We don't want to be in any business in which we can't grow. We want the traditional business to grow in absolute dollars even though as a percentage mix it's going to decrease," Bird said.

"The objective is to have it grow 15% a year. Well, to grow you've got to go into new geographic territories. To go in there, you've got to have local presence," he noted.

Itel is increasingly installing on-line capabilities in its batch centers, he said, and will continue to acquire firms in the industry.

Bird sees an eventual consolidation from the approximately 2,000 companies now in the services industry to about 10 or 20 large firms. Itel is trying to be one of the big ones, he said.

Staying in Batch

Itel intends to stay in the batch business because "it's profitable, very broad-based, relatively safe and it's not affected too much by the economy. But the big upside opportunities are the on-line areas," Bird said.

The firm has about 8,000 batch clients for payroll and accounts receivable type of work and another 6,000 in automotive processing, he said.

"These clients comprise a very broad base. They don't pay a lot, but are a very valuable asset because they don't turn over," he said. "The margins are good."

In the on-line area, Itel has a billing inventory control system for wholesale distributors that has about 350 to 400 clients and a banking system with about 35 clients. It also offers systems for truckers, brokerage houses, automotive firms and insurance firms as well as scientific time-sharing users.

Instead of the 13,000 clients in batch, it has about 1,200 on-line clients, but the per-client revenue is bigger, Bird said.

Executive Corner

- Dr. Lawrence G. Roberts, president of Telenet Corp., has been appointed chairman of the board. Anthony A. Barnett has been elected to succeed Roberts as president.
- C. Rae Quinn has been promoted to senior vice-president of marketing development at Rapidata, Inc.
- Fred W. Kuappel has been named vice-president of peripheral systems operations for Control Data Corp.'s Engineering Services.
- Martin Rouff has been promoted to vice-president of operations for Datatrol, Inc.
- Howard L. Crispin has been promoted to senior vice-president of communications for Scientific-Atlanta, Inc.
- E.W. Emmerich has been appointed vice-president of marketing for Calma.
- Stephen G. Jerritts has been named vice-president and general manager of Honeywell's U.S. Information Systems Group.
- Carlos L. Dodd has been named vice-president, international sales, for Spectron Corp.
- Mark Mougel has been appointed vice-president of marketing for Dataflux Corp.
- Thomas M. O'Brien has joined Insyte Applications Corp. as vice-president, Commercial Division.
- Donald F. Greer has been elected assistant vice-president, general services, of Communications Satellite Corp.
- Julian Davidson has joined System Development Corp. as vice-president of government systems.
- Edward A. Money has been elected vice-president of finance and treasurer at Datum, Inc.
- Saul Dinman, executive vice-president, is now responsible for all marketing functions at GRI Computer Corp. and Vincent Finlay, director of sales, is responsible for sales of the System 99 product line. Robert Knapp, former vice-president of sales and marketing, has left GRI for personal reasons.
- Owen F. Keefe has been named vice-president of field operations for Honeywell's Field Engineering Division.
- Ralph Thomason has been appointed director of sales at Ramtek Corp.
- John R. Walker has been appointed senior vice-president of operations and Ralph Burgess was named director of planning, inventory control and traffic for Datapoint Corp.
- Martin R. Browne was named vice-president of operations, program management and customer service for ASK Computer Services, Inc.
- The Datacom Co. has named six new vice-presidents: Dewey R. Hemphill, operations; Carol D. McInnis, broadcast services; Skip Sawyer, sales; Ronald B. Wilkes, systems; Rick Simmons, communications software and Jim Cook, research and development.
- David Trogan has been named general manager and divisional vice-president of University Computing Co.'s Data Services Division.
- Salvatore Alini has been named director of systems development for Interdata, Inc.
- Ted Schindler has been appointed director of marketing, small business computers, for Olivetti Corp. of America.
- James P. Ambrose has been appointed director of operations for Unitrode Corp.
- Robert K. Thomas has been named director, marketing management consulting, software services and products, for MIS International, Inc.
- Charles Kotsaftis has been appointed national sales manager for computers at Rolm Corp.

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Compec Sets Exhibits, Seminars

BRUSSELS, Belgium — Two seminars will be held during Compec Europe 1977 at the Centre Rogier here May 10-12.

A seminar on visual display units will be presented by IPC Science and Technology Press in association with the British Computer Society on May 10.

The following day, a seminar entitled "Microprocessors 77," organized by *Microprocessors*, a British journal, will be held.

Both seminar programs will be designed to combine a practical review of the equipment and systems currently available with an assessment of the likely trends and applications in their respective fields.

Information about the Compec Europe systems and peripherals exhibition is available from Iliffe Promotions Ltd., Dorset House, Stamford St., London SE1 9LU, England. Seminar information is available from IPC Science and Technology Press Ltd., 32 High St., Guildford GU1 3EW, England.

Nippon Targets U.S. End Users With Establishment of Subsidiary

By Elinor Gebremedhin
Special to Computerworld

TOKYO — In a move from an unexpected corner, Japan's Nippon Electric Co. (NEC) has announced it will establish an American subsidiary this spring. The subsidiary, tentatively named Neac Computers, will be based in Boston, according to sources in Japan.

It's no surprise to Japan watchers that the Japanese are entering the U.S. domestic computer market. Japanese manufacturers have discussed it openly and Japan's Ministry of International Trade and Industry (Miti) has recently made a number of moves strongly supportive of international expansion for its computer industry.

The unexpected element is the company involved. NEC ranks third among Japanese computer manufacturers, behind Fujitsu (the IBM of the Japanese market) and the diversified giant Hitachi.

NEC is by no means a small company, but until now the international spotlight has been on Fujitsu's recent affiliations with three companies: U.S.-based Amdahl Corp., Canada-based Consolidated Computer Services and Spain's new Secoinsa Co. Hitachi has also enjoyed some publicity as a result of "feelers" sent out to Control Data Corp and Itel.

NEC's approach has been entirely different from that of the other companies. NEC has quietly laid plans for a wholly owned subsidiary in the U.S. as its opening move instead of seeking alliances with existing companies and directing its major energies toward non-U.S. markets first.

The Japanese company plans to start out by offering Neac System 100 office computers and N-6300 series intelligent terminals to end users and a variety of peripherals (disks, tapes and printers) to OEMs.

Later the American operation will expand to include sales of the new Acos-77 line and production of peripherals.

The Acos-77 line covers the same range in the market as IBM's 370 series, from the Acos Model 200 (equivalent to the 370/115-2) to the Acos Model 800 (equivalent to the 370/195).

Like most of the world's computer lines, the Acos series is in the IBM-oriented design tradition. It has also profited from analyses of Honeywell and General Electric (GE) equipment. Acos software is compatible with GE Gecos and Honeywell Geos software in many respects.

In Japan, the Acos series has been the best seller of three newly developed product lines currently being sold by the Japanese. The series was developed by both NEC and Toshiba in a joint effort partially subsidized by Miti.

The sales targets that NEC revealed should give American makers cause for thought. The new company will start out with a healthy initial capital of about $700,000 supplied by the parent company in Japan. It expects to do $5.4 million worth of business in 1977, $17.1 million worth in 1979 and $50.4 million worth in 1980.

Gebremedhin is an editor at Auerbach Publishers, Inc.

International News

Foreign Orders & Installations

Eighty Danish municipalities accounting for over half the country's population are installing a $1.5 million network of NCR Corp. terminals including CRTs, Model 275 remittance-control terminals and Model 2500 modular terminal systems. The network will handle a variety of municipal applications.

Iran's Abadan Institute of Technology has ordered a Univac 1100/11 system for applying advanced data management techniques, simulation and scientific problem solving.

The fire departments of Osaka City and Nagoya City, Japan, have ordered computer-aided dispatch systems combining telephone and mobile radio systems with a computer subsystem from Fujitsu Ltd.

The City of Bath, England, and the district councils of Wansdyke and Kingswood have ordered a Honeywell Information Systems Series 60 Level 62 system to handle accounting for the three authorities.

Sun Aluminum Industries, Ltd. of Japan has ordered four additional Measurex Corp. 1050 systems.

The Paris headquarters of the Organization for Economic Cooperation and Development, a group of 25 countries, has ordered a Burroughs B6700 system valued at $1.4 million.

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Do it now.

Expects Nay Vote

IBM Plans Referendum on Unionization for UK Workers

By Ivan Berenyi
Special to Computerworld

GREENOCK, Scotland — IBM is preparing a company referendum on whether its 13,000 workers in Britain want to be officially represented by trade unions.

The time could scarcely be less auspicious.

IBM has been forced into the ballot because a UK government labor relations agency has ruled such a referendum should take place at the company's plant here, where agitation for unionization went to arbitration some weeks ago.

Rather than hold the referendum at just one plant — the one most likely to vote in favor of trade unions — IBM has opted to make it company wide in the hope that the result will be a massive "no."

Although IBM subsidiaries in Germany, France and Italy have bowed to pressure for union representation, in strike-torn Britain the firm has preferred to make the issue irrelevant by a combination of higher than average salaries and a blanket refusal to recognize unions.

With a high proportion of graduates to manual workers — one in three — and its traditional emphasis on individual endeavor, the company has never before been seriously worried by union pressure.

But its policy could be breached here at Greenock, a manufacturing plant drawing much of its

International News

workforce from the traditionally militant socialist shipbuilding yards. Any such breach would pose a serious dilemma for the company.

The fall of the pound sterling coupled with two years of austerity budgeting have made British labor cheap and given a massive boost to British exports. Both argue in favor of manufacturing expansion for a U.S.-based multinational like IBM.

But the experience of Ford Motor Co. is not encouraging. Plagued by strikes in its highly unionized plants around London and in the Midlands, Ford has reversed initial thoughts on expanding in the UK and built one of the main factories for the production of its new minicar, the Fiesta, in Spain — in spite of that country's 20% inflation and uncertain political future.

Nay Vote Expected

No one at IBM expects the workforce as a whole will vote for unionization. The last time opinion was tested privately within the company, less than 20% voted in favor — and that was just four years ago.

But IBM is hedging its bets by taking legal advice on where it will stand if this factory — whose votes will be counted separately as well as aggregated with those of the whole work force — votes for unionization when the company generally votes against it.

"We would recognize unions if the majority of our employees wanted them and if it was the law," managing director Eddie Nixon said.

But he acknowledged this would mean a radical revision of IBM's labor relations style in the UK. "A third party coming into the company would change things fundamentally. We would have to rethink our whole management system," he said, adding "I am not antiunion. It's just that I am pro-IBM."

Even if the company fights off this challenge from one of its oldest union enemies, the aggressive ASTMS, its paternalist approach to labor relations which is probably unique in British industry could be mortally wounded by future government action.

The heavily union-influenced British Labor government is considering laws which would insist that companies open their books to union inspection — alleged management secrecy is one of the issues that has prompted the IBM Greenock dispute — and that union directors should be appointed to company boards.

Report Predicts French DP Demand To Grow 23% Annually Until 1980

PARIS — The Seventh French Five Year Plan calls for domestic demand for computer-related products to show an annual growth rate of 23.6% between 1975 and 1980.

This will result in an increase of sales by nearly $4 billion, with the total domestic market for computers and peripherals totaling nearly $6 billion, according to a U.S. Department of Commerce report.

By 1980, imports in the plan are predicted to rise $1.4 billion from 1975's level of $650 million, an annual increase of 16.8%, it added.

"The U.S. is recognized as the leader in this field. According to U.S. statistics, exports to France in this target industry for 1975 were $195 million, of which computers ulone represented $57 million," Commerce stated.

In 1974, France's total imports of computers and peripherals equaled $426.5 million. Imports are expected to reach $660 million this year and $1 billion by 1980, Commerce indicated.

The U.S. is the leading foreign supplier to the market, followed by the UK, West Germany and Italy. Japan is not a traditional supplier to the French market, selling only a small volume of peripherals, Commerce noted.

The U.S. holds close to 65% of the total installed base for general-purpose computers while the comparable figure for minicomputers is less than 50%, the study found.

International Computer Ltd. (ICL), the British firm, is the main foreign competitor, having a long history in France which in the last two years has been ICL's most successful operation in a non-English speaking country.

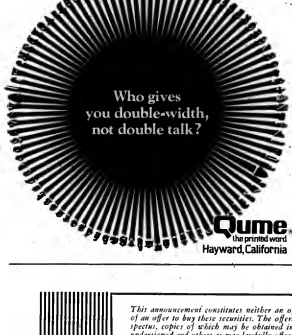
The French government encourages the development of domestic computer production, Commerce said.

"A recent market survey anticipates steady growth in all sectors of the French market over the next five years. France is under computerized relative to its economy compared with many other European countries and the French government favors and encourages developments of computer-based techniques throughout all phases of activity," the report said.

Market growth is expected to be most rapid at the extreme ends of the scale — large computer systems and minicomputers. There will be an absolute increase in medium-size systems, Commerce said, but their share of the market will decrease.

Peripheral sales are likely to outstrip the sales of computer systems themselves in terms of percentage growth in France in the next five years, Commerce predicted.

"Given the increasing small system/mini orientation of the marketplace, good growth is foreseen in removable disks, diskettes and magnetic cassettes and cartridges. Optical character recognition is a slow growing market. Computer output microfilm, however, is receiving increasing acceptance, presenting an opportunity area."



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Courses on Microcomputers Set by Integrated, Others

CULVER CITY, Calif. — Integrated Computer Systems, Inc. is offering three courses, which may be combined. The titles of two of the courses are "Microprocessor Project Management" and "Microprocessors and Microcomputers; A Technical Introduction." Both are one-day events.

A two-day hands-on microcomputer programming workshop is also offered.

The courses which range in price from $195 for one day to $395 for two days, or all three for $595, will be given in Los Angeles, Washington, D.C., Boston and New York City.

The firm is also offering several on-site courses as well as a self-study microcomputer training system, which includes an assembled Intel 8080 kit keyboard and test for $50.

Integrated Computer Systems is at 4445 Overland Ave., Culver City, Calif. 90230.

Intel Offers Choice of Topics at Workshop

SANTA CLARA, Calif. — Intel Corp. is conducting a variety of workshops on MCS-80, PL/M language, MCS-48, programmable peripheral circuits and Series 3000.

All but the Series 3000 will be held here and in Boston and Chicago. The course on the 3000 will be offered only in Santa Clara.

Prices for the four-day workshops, which are limited to 12 attendees, range from $250 to $450.

Information is available from Susan Derometh, MCD Workshops, Intel Corp., 2880 Northwestern Parkway, Santa Clara, Calif. 95051.

Attendees at Workshop To Take Micro Home

LAFAYETTE, Ind. — Wintek Corp. is offering a "hands-on microprocessor short course with free take-home microcomputer," which will be a Motorola 6800 with various interfaces and memory.

Four Cities

The course costs $495 and will be offered here and in Cleveland, Ohio, Syracuse, N.Y., and Hackensack, N.J., between May and June.

Wintek is at 902 N. 9th St., Lafayette, Ind. 47904.

Mits Subsidiary Looking For Altair Applications

ATLANTA — Mits, Inc., the manufacturer of the Altair microcomputer, has formed a subsidiary to provide applications software for its microcomputers.

The Altair Software Distribution Co. (ASDC) will acquire, evaluate, document and distribute the applications through Altair Computer Centers.

The firm will acquire software either through a direct purchase arrangement or a continuing royalty fee.

"We are trying to encourage creativity and make it financially attractive for people to produce quality software for the Altair family of computers," Mits President Ed Roberts said.

Ron Roberts, president of ASDC, said the firm is looking for first-quality software, that which "has been carefully designed, properly coded and thoroughly debugged."

ASDC has a booklet describing the standards for applications software and the documentation needed. The booklet is called the "ASDC Software Submittal Packet."

Further information can be obtained from ASDC at Suite 343, 3330 Peachtree Road N.E., Atlanta, Ga. 30326.

TI Has 32K-Bit Fully Static ROM

DALLAS — Texas Instruments, Inc.'s TMS 4732 is a 32K-bit, fully static MOS read-only memory (ROM) organized as 4K words of 8-bit length and fabricated with N-channel silicon-gate technology.

Intended for high-density, fixed memory applications such as logic function generators and microprogramming, the 8-bit byte organization makes it particularly useful in microprocessor-based systems, TI said.

Maximum access time is 450 nsec, minimum cycle time is 450 nsec and typical power dissipation is 450 mW. The unit is supplied in 24-pin plastic DIP.

The TMS 4732 is fully TTL-compatible, the firm said. Two programmable chip select controls are provided for data readout and system decode flexibility.

The TMS 4732 is upward pin-compatible with the TMS 4700 ROM, the TMS 2708 erasable programmable ROM and the 8316B.

The TMS 4732 sells for $20 each in quantities of 1,000.

TI is at P.O. Box 5012, M/S 308, Dallas, Texas 75222.

National Semi Adds Family of Processors

SANTA CLARA, Calif. — National Semiconductor's calculator-oriented processors (Cops) were designed to fill the gap between general-purpose microprocessors and dedicated custom circuits, according to the firm.

Each of the four units contains all that is necessary to implement most dedicated control applications for less than $10, the firm said. The units are of P-channel MOS/LSI construction.

The MM5781 and MM5782 set, the MM5799 and the simplified MM7140 contain arithmetic logic unit, read-only memory, random-access memory and I/O circuitry.

National Semi is at 2900 Semiconductor Drive, Santa Clara, Calif. 95051.

Cassette/Interface Fits With S-100 Bus

GARLAND, Texas — Percom Data Co.'s CI-812 cassette/terminal interface card is compatible with the S-100 bus and features an RS-232 link.

It provides phase encoding at speeds of 30-, 60-, 120- or 240 byte/sec.

The card permits data exchange via the RS-232 interface at 300 to 9,600 bit/sec.

The CI-812 with instruction manual costs $89.95 in kit form or $119.95 assembled. There is a 5% fee for mail orders, the firm added from 4021 Windsor, Garland, Texas 75042.

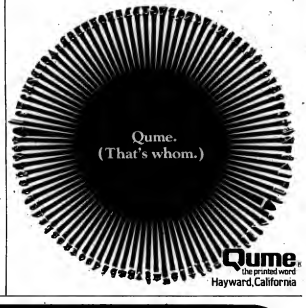
Option Aids Micro-68

SAN DIEGO — Electronic Product Associates, Inc.'s Data Catcher option for its Micro-68 line of Motorola 6800 microprocessor prototype development systems provides for single-step operation of the Micro-68, according to the firm.

The Data Catcher, which costs $140, captures address and operand after each machine instruction and displays the data on a hexadecimal display.

Electronic Product Associates is at 1157 Vega St., San Diego, Calif. 92110.

Micromania



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MODEL 30 MAGSTRIPE™ CARD READER — Reads three channels (ABA, IATA, THRIFT) on magnetically encoded card. External, speed compensating electronics is required to convert the Aiken code on the card into serial binary data.

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70% of Planned Revenue in Backlog

CDC Optimistic About '77 After '76 Net Rises 29%

MINNEAPOLIS – Control Data Corp. is "optimistic about 1977" and has about 70% of planned large-scale computer systems revenue for 1977 already in backlog at the end of 1976, according to the firm's 1976 annual report.

Chairman William C. Norris said CDC is committed to achieving "reasonable and steady profit increases commensurate with industry trends."

In 1976, as previously announced, the company had consolidated after-tax net earnings of $48.6 million, up 29% as a result of gains in both principal segments of the company – the computer business and financial services.

Norris said that in 1977 the company will introduce a number of new products and services in its computer business.

At Commercial Credit, he noted, 1977 should show further profit gains as a result of continued improvements in insurance operations and higher levels of cash employed in financial services.

In 1976, the company invested $58 million in computer systems technology and indicated that it expects to invest at that level for the next five years.

Report Details

The report, which for the first time displayed combined results of both segments of the business, showed that total revenues were $2.01 billion and total assets were $5.1 billion.

The report also detailed, for the first time, the company's four major product areas by percentage of combined revenue: Financial Services, 33% or $651 million; Computer Services, 25% or $497 million; Computer Systems, 21% or $417 million; and Peripheral Products, 21% or $417 million.

The report revealed that CDC expects to ship 90% of its large computers through 1980 in seven key industries: weather, atomic/nuclear, education, electric utilities, petroleum, data communications and scientific and engineering applications.

Computer business revenue rose by $111.9 million or 9% in 1976 over the $1.2 billion level reached in 1975.

The largest increases came in sales revenues principally related to the peripheral-products operations and in service revenues, which reached $497.1 million.

Rental revenues declined approximately 8.3% as a result of purchased conversions of leased equipment amounting to $48 million in 1975 and $56 million in 1976.

Total costs and expenses in the computer business in 1976 rose $112.6 million or 9.2% over the preceding year, paralleling the overall increase in revenues.

The most significant increase in percentage terms was R&D which rose $9.6 million or 19.5% over the 1975 level.

International Business

International business in 1976 was up 12% and accounted for $458 million or 34% of CDC's computer business revenue.

Only about 1% of computer business revenues, according to the report, came from sales to Eastern Bloc countries. The company currently has operations in 33 countries.

Norris noted that CDC continues to "emphasize expansion" in computer services. Revenues in this segment of the business were up 12%. "We expect this to approach $1 billion by 1981," he predicted.

Commercial Credit recorded a 27% increase in net earnings in 1976 as a result of an "international improvement in both insurance operations and in the worldwide finance business," Norris said.

The report disclosed that losses in overseas finance operations in 1976 were reduced to $3 million from $14.5 million and that these improvements are expected to continue.

The company reached a "significant milestone," according to the report, when personal loans outstanding reached the $1 billion mark for the first time in Commercial Credit's 64-year history.

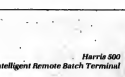
Healthy Improvement

Profitability in Commercial Credit's health and life insurance business also improved with profits of $3.7 million compared to a loss of $2.9 million in 1975, the report said.

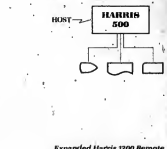
The report described a 19% rise to $417 million in 1976 revenues for CDC's computer peripheral products. It also charted a four-year, 66% increase in the number of other equipment manufacturers that buy CDC peripherals.

In 1976, cooperative technology programs with other countries and companies produced "rewarding results," CDC said.

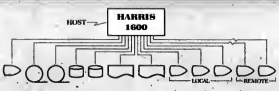
Harris 500 Intelligent Remote Batch Terminal



Expanded Harris 1200 Remote Batch Terminal supporting multiple peripherals into mainframes such as IBM, CDC, UNIVAC and Honeywell.



Interactive processing from local or remote CRT terminals combines with concurrent remote batch to a host computer providing optimal balance of processing power to each location.



Acquisitions

Univac ISS Gains Disk Memory System

CUPERTINO, Calif. — Univac's ISS operation has acquired from National Micronetics, Inc. the design, manufacturing and marketing rights for the Series 2500 disk memory system.

Everett T. Bahre, ISS vice-president and general manager, said the acquisition also included certain inventory and manufacturing assets.

The Series 2500 is a fixed-head disk file providing 4.8- to 51.2 million bits of storage. Utilizing "Winchester"-equivalent head/disk interface technology, the unit has an average access time of 8.3 msec.

ISS intends to offer the disk drive to the OEM market with first deliveries beginning immediately. Potential markets include point-of-sale equipment and minicomputers.

Other Moves

Quantor Corp. and **General Micrographics Corp.** have agreed to terminate previously announced discussions relative to the acquisition of General Micrographics by Quantor.

National Computer Systems, Inc. has agreed to acquire the assets of the **Opscan Division** and the **Precision Business Forms Division** of Optical Scanning Corp. for an undisclosed amount of cash.

Potter Chairman Agrees To Diminish His Control

WASHINGTON, D.C. — John T. Potter, chairman of the board of Potter Instruments, Inc., agreed to diminished control of the firm for three years as part of a permanent injunction issued by a U.S. District Court here recently following a complaint filed by the Securities and Exchange Commission (SEC).

Potter agreed not to use his position as the largest stockholder to defeat any course of action approved by a majority of the board of directors for three years.

Potter was charged with receiving undisclosed benefits from the firm and with concealing the firm's deteriorating financial condition in 1973 and 1974.

He assented to the order without admitting or denying allegations that he had received about $100,000 annually in corporate funds from 1970 to 1974 which he used to pay upkeep on his home and yacht and for salaries for servants in his home and aboard the yacht. The help was listed on the corporate payroll as maintenance personnel and engineers.

The firm concealed its deteriorating financial position in 1974 by failing to indicate obsolete inventories and other charges, according to SEC.

For the first nine months of 1974, the firm reported earnings of $1 million but sustained an $11.4 million loss for the year.

In addition, the company had a deferred compensation plan for directors in 1969 which was not disclosed until February 1975, the SEC alleged.

As part of the agreement, until 1979 the company will appoint only outside directors approved by the SEC. The firm has appointed an audit committee from the board of directors.

Potter Instruments is preparing for its stockholders a description of material financial developments since 1975 and a summary of the SEC charges.

Potter Instruments previously ran afoul of the SEC and in 1975 was issued a permanent injunction enjoining it from failing to file timely reports with the SEC.

Potter Instruments is currently operating under Chapter 11. The general creditors committee recently approved a settlement plan.

Nickels & Dimes

Prime Computer's offering of 508,000 shares of common at $14 per share sold out. The company provided 350,000 shares, a warrantholder offered 125,000 shares and certain stockholders sold 33,000. The $5.2 million proceeds to the company will be used for partial repayment of bank indebtedness.

$$$

Data Card has arranged $7.1 million in financing from its largest shareholder Deluxe Check Printers, Inc., in the form of a 15-year 8.5% annual interest note.

Along with the investment, Data Card declared a 50% stock dividend for holders of record March 22.

$$$

Itel has assured redemption of 98.2% or $19,650,000 principal amount of its 8% convertible subordinated debentures. Only 1.8% or $350,000 principal amount of the debentures was tendered for conversion. Conversion rights expired on March 7.

$$$

Control Data Corp. has declared an annual dividend of 15 cents a share payable April 18 to holders of record March 21.

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You've spent a lot of time looking at data communications hardware, software and services. Everybody has. But now you've looked far enough. Whatever your requirements, you'll find Harris provides the remote batch terminals, remote communications processors, distributed processing systems, peripherals, maintenance and software support you need . . . for entry-level, medium- or high-function applications. Read on for a close look at Harris now. It's a sure way to make things look up for you!

Look at Harris Remote Batch Terminals

Harris has two product families designed to fill the needs of remote batch terminal users: the entry-level Harris 500 and the high-function Harris 1200. Both families are structured around powerful minicomputers, enabling you to configure the exact system you require for specific applications . . . choosing from families of proven peripherals. Data communication rates of up to 50K bps can be achieved. Maximum throughput rates are possible with full-duplex communications to central computers supported by a Harris communications controller.

Look at Harris Remote Communications Processors

The Harris 1600 family is designed for users needing expanded capabilities in remote communications and processing. Harris provides you with a transitional bridge to distributed processing functions via the Harris 1610 or 1620 remote batch systems.

You can begin with a Harris 1610 RBT supporting a line printer, card reader and optional card punch and go on from there to a Harris 1620 remote communications processor with multiple printers, tape drives and other peripherals supporting multiple concurrent emulation into as many as four mainframes *simultaneously*. This Harris innovation means you can access your in-house computer system, for example, at the same time you access an outside computer utility — from one 1600! It's made possible by the operating system designed into our advanced terminals.

Look at Harris Systems for Distributed Processing

For emerging distributed processing applications requiring interactive source-document entry, inquiry/response and file manipulation . . . such as systems for order entry, inventory control and personnel record search/update, Harris offers enhancements to the 1600 including microprocessor-based CRTs, disk resident software, a simple interactive language (REGAL) and COBOL.

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For a more detailed look at what Harris can do for you, contact your local Harris sales office or Harris Corporation, Data Communications Division, 11268 Indian Trail, P.O. Box 44070, Dallas, Texas 75234, (214) 620-4400.

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The State University of New York at Binghamton is seeking a programmer/analyst experienced in the design and implementation of administrative computer applications. The individual in this position will have the responsibility of support and coordination of the administrative data processing activities of remote campuses utilizing the SUNY-Binghamton Computer Center facility. This facility has a diverse total spectrum of administrative processing, interactive and batch; from consultation to use of languages and utilities to design and implementation of general applications software.

This position requires a bachelor's degree and three to five years' experience in administrative applications design and development, preferably in a medium scale IBM O/S environment. Experience in university-type applications is a plus.

Salary range for the position is low-to-mid teens. Starting salary will depend on qualifications. In addition, SUNY offers an outstanding employee benefits package.

The Binghamton campus is one of four university centers in the State University of New York system. The campus of 9,000 students is located in central New York near a variety of cultural and recreational resources.

SUNY-Binghamton is an EOP. Please send resume by 4/15/77 to:

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You'll be involved in a diverse range of applications, working with 370/158 OS-VS2 and versatile EDP staff responsible for producing vital management information. To qualify, you must have at least 2-3 years experience with ANSI COBOL, DOS, TP, and preferably in commercial or manufacturing applications also essential.

Positions located at our park-like headquarter's site in Morris County, a region offering fine housing and recreational opportunities. Salary and benefits are excellent. Send resume indicating salary history and requirements, in confidence, to: S.A. Kerwin

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Division of Student Services and Special Programs

PROGRAM ADMINISTRATOR (SYSTEMS ANALYST)

Act as information processing consultant to the various departments within the UWM Division of Student Services; liaison with UWM's Computing Services Division. Duties include responsible implementation responsibility, communicating plans for change with people outside the data processing field; help implement new systems and write procedures manuals.

A master's degree is required; two years experience in systems analysis and design at computer and manual information processing systems, including the whole system operating cycle from data collection through data-base maintenance and reporting.

Salary: $13,916-$19,000 per year
Application Deadline: 3/25/77.

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Supervise and coordinate activities of Financial Aid Counselors and two accountants. Develop and implement procedures of need analysis, awarding, accounting, bookkeeping and reporting. Serve as chief administrator in the absence of the Director.

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Apply to:
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- SYSTEMS ANALYSTS

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PACKAGE INSTALLATION & SUPPORT
RESEARCH & SYSTEMS PLANNING

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Coordinate efforts of a Senior Management Task Force in redefining the capabilities of a major system providing direct service to our customers. Direct a 10 member Project Team (of Analysts and Programmers) in the redesign and implementation of this system utilizing our IBM 360/75 computer with TOTAL. Position requires demonstrated success in the design and implementation of major systems projects, prior supervisory responsibility for other analysts' activities on a project, project planning/management skills, excellent written and oral communications skills. Familiarity with data base management programs, particularly TOTAL, is highly desirable.

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Responsible as a team member for the design, implementation, and testing of an interactive general purpose operating system to support cobol applications and utilities written in assembly languages. It requires a BS in Computer Science and a minimum of 1 to 5 years experience in assembly languages.

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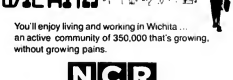

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SYSTEMS PROGRAMMER/ ANALYST

GS-11/12/13 $17,056-$31,598

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QUALIFICATIONS REQUIRED: Ability to perform systems programmer/analyst functions-including installation, maintenance, modification, and operation support of large, generalized software systems such as OS/VS1, CICS, and ATS. Must possess working knowledge of ALC programming, OS/VS1 JCL, and OS/VS1 Utility and Service Programs.

Must have three to five years programming analysis experience in areas described above, including at least two years using ALC and one year using PL/1 COBOL.

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- SYSTEMS ANALYSIS
- SYSTEMS PROGRAMMING
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- SYSTEMS INSTRUCTION

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To qualify for this position you should possess several years of strong technical background coupled with 5-10 years of a successful Business/Marketing oriented career. A technical degree plus an MBA, or equivalent, would be desirable.

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A minimum of 1 year experience is required working on both the sales side and the technical side of a university computer operation. Additional academic or scientific computing experience may substitute for part of the educational requirement.

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Chicago	312/782-0857	Irvine, Ca.	714/833-1730
Oak Brook, Ill.	312/986-0422	Los Angeles	213/388-5500
Cleveland	216/771-2070	Palo Alto	415/326-7155
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We also have openings for simulation analysis and design personnel.

A degree in engineering, computer science or meth is required. For consideration, please send your resume end salery requirements in complete confidence to:

NCR

Industrial Relations
Communication Systems Div.
NCR Corporation
3325 Pfett Springs Rd.
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SYSTEMS PROGRAMMERS

Two staff positions and one supervisory position exist in an expanding technical support group. We are currently converting from OS to SVS and CICS to CICS/VS using two 370/158 computers. Skills required include three to four years experience in OS/VS internals, SYSGENS, telecommunications and performance monitoring.

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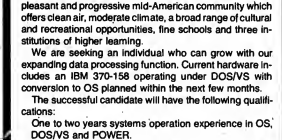

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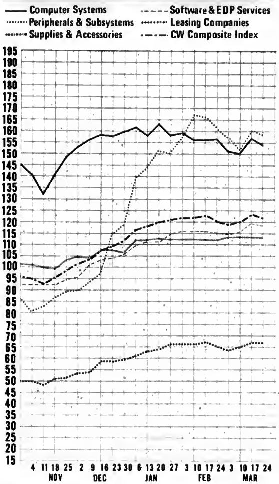

Earnings Reports

ON-LINE SYSTEMS
Three Months Ended Jan. 31

	1077	1976
Shr Ernd	$.42	$.30
Revenue	4,095,604	3,220,111
Earnings	365,233	246,547
9 Mo Shr	1.08	55
Revenue	11,712,742	8,294,102
Earnings	930,420	456,960

SIEMENS AG
Year Ended Sept. 30

	1976 (000)	1076 (000)
Revenue	$8,634,300	$7,458,200
Earnings	249,800	186,800

TELEDYNE
Year Ended Dec. 31

	1076 (000)	1975 (000)
Shr Ernd	$10.52	a$5.65
Revenue	1,040,000	1,710,000
Earnings	134,870	101,706
3 Mo Shr	2.07	a1.88
Revenue	515,000	410,000
Earnings	35,332	31,060

a-Adjusted for May 1976 3% stock dividend

TEXAS INSTRUMENTS
Year Ended Dec. 31

	1976 (000)	1975 (000)
Shr Ernd	$4.25	$2.71
Revenue	1,658,607	1,367,621
Earnings	07,420	62,142
3 Mo Shr	1.26	01
Revenue	470,906	390,842
Earnings	29,305	20,783

AMDAHL
Year Ended Dec. 31

	1076	a1975
Shr Ernd	$3.30	...
Revenue	02,620,000	...
Tax Cred	11,010,000	...
Earnings	22,603,000	...
3 Mo Shr	1.60	...
Revenue	40,484,000	...
Tax Cred	6,235,000	...
Earnings	12,721,000	...

a-Company began operations in fourth quarter of 1075.

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Computerworld Stock Trading Summary

CLOSING PRICES WEDNESDAY, MARCH 23, 1977

TRADE*QUOTES

All statistics compiled, computed and formatted by TRADE*QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		1976-77 RANGE (1)	CLOSE MAR 23 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	AMDAHL CORP	25- 40	26 3/4	-1 1/4	-4.4
N	BURROUGHS CORP	66-108	66 7/8	-2 1/2	-3.6
O	COMPUTER AUTOMATION	10- 25	24	-1 1/8	-4.4
N	CONTROL DATA CORP	18- 27	22 1/4	- 1/2	-2.1
N	DATA GENERAL CORP	40- 60	43 1/2	-1 7/8	-4.1
O	DATAPOINT CORP	20- 46	21 1/4	-2 3/4	-11.4
N	DIGITAL EQUIPMENT	41- 60	46	+ 3/4	+1.6
N	ELECTRONIC ASSOC.	2- 5	2 1/4	- 1/8	-5.2
A	ELECTRONIC ENGINEER.	7- 16	8 3/4	+ 5/8	+7.6
O	FOUR-PHASE SYSTEMS	13- 21	15 3/8	+ 5/8	+4.2
N	FOXBORO	28- 51	48 1/2	0	0.0
O	GENERAL AUTOMATION	4- 11	6 5/8	- 3/4	-10.5
O	GRI COMPUTER CORP	1- 1	5/8	0	0.0
N	HEWLETT-PACKARD CO	69-117	76	+ 1/4	+0.3
N	HONEYWELL INC	34- 56	50 1/2	+1 3/8	+2.7
N	IBM	227-288	282 1/2	-1 1/2	-0.5
O	MANAGEMENT ASSIST	1- 9	6 7/8	- 1/4	-3.5
O	MEMOREX	17- 35	27 5/8	- 5/8	-1.5
O	MICRODATA CORP	7- 28	8	0	0.0
C	MODULAR COMPUTER SYS	3- 14	5 3/4	0	0.0
N	NCR	24- 38	36 7/8	- 1/4	-0.6
O	PRIME COMPUTER INC	4- 18	14 3/4	+ 5/8	+4.4
N	PERKIN-ELMER	18- 27	17 5/8	- 5/8	-3.4
N	RAYTHEON CO	45- 67	55 1/4	-1 1/8	-1.9
N	SPERRY RAND	38- 52	38 3/4	+ 5/8	+1.6
O	SYCOR INC	9- 31	10 3/4	- 5/8	-5.4
A	SYSTEMS ENG. LABS	5- 10	5 5/8	- 5/8	-10.0
N	VARIAN ASSOCIATES	12- 19	17 5/8	- 1/4	-1.5
A	WANG LABS.	11- 20	17 1/4	- 1/4	-1.4

LEASING COMPANIES

EXCH		1976-77 RANGE (1)	CLOSE MAR 23 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	BOOTHE COMPUTER CORP	1- 9	10 3/4	+1 3/8	+14.6
O	COMDISCO INC	5- 15	11	+ 1/4	+2.3
A	COMMERCE GROUP CORP	2- 3	1 7/8	0	0.0
A	COMPUTER INVSTRS GRP	1- 5	1 1/8	- 1/4	-18.1
M	DATRONIC RENTAL	1- 8	1 1/4	0	0.0
A	DCL INC	1- 2	1 3/4	+ 1/4	+16.6
N	DPF INC	5- 8	7 3/8	0	0.0
N	ITEL	6- 16	14 1/8	- 3/8	-2.5
N	LEASCO CORP	6- 22	19	0	0.0
O	LEASPAC CORP	0- 1	3/4	- 1/4	-25.0
C	ARG INC	0- 1	1/4	0	0.0
A	PIONEER TEX CORP	6- 11	8 3/8	- 1/4	-2.8
N	U.S. LEASING	7- 12	10 3/8	- 1/2	-4.5

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-BALT-WASH
L=NATIONAL; M=MIDWEST; O=OVER-THE-COUNTER
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EXCH		1976-77 RANGE (1)	CLOSE MAR 23 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	ADVANCED COMP TECH	1- 3	1 1/8	- 1/4	-18.1
O	ANACOMP INC	6- 11	8 1/8	- 1/8	-1.5
A	APPLIED DATA RES.	2- 7	5 5/8	- 1/8	-2.1
N	AUTOMATIC DATA PROC	17- 35	26 1/8	+ 7/8	+5.4
O	COLEMAN AMERICAN COS	2- 6	2	0	0.0
O	COMPU-SERV NETWORK	5- 15	14	0	0.0
O	COMP ELECTION SYSTMS	5- 9	7 1/4	- 1/4	-5.5
O	COMPUTER HORIZONS	1- 2	1 1/4	0	0.0
O	COMPUTER NETWORK	2- 8	6 5/8	0	0.0
N	COMPUTER SCIENCES	4- 9	7 5/8	- 1/4	-3.1
O	COMPUTER TASK GROUP	1- 2	1 1/4	0	0.0
O	COMPUTER USAGE	2- 6	2 1/8	- 1/4	-10.5
O	COMSHARE	2- 9	5 1/2	0	0.0
O	DATA DIMENSIONS INC	2- 5	4 1/2	- 1/8	-2.7
O	DATATAB	1- 2	2 1/4	0	0.0
N	ELECTRONIC DATA SYS.	12- 19	16 5/8	+ 1/4	+1.5
O	INFONATIONAL INC	1- 1	1/8	0	0.0
O	INSYTE CORP	1- 5	1 7/8	- 1/8	-6.2
O	IPS COMPUTER MARKET.	1- 2	3/4	0	0.0
O	KEANE ASSOCIATES	2- 4	2 7/8	0	0.0
O	KEYDATA CORP	1- 5	2 3/4	+ 1/8	+4.7
A	LOGICON	3- 16	15 3/4	+1 7/8	+13.5
A	MANAGEMENT DATA	1- 5	1 3/8	0	0.0
A	NATIONAL CSS INC	13- 25	20 1/4	- 1/8	-0.6
O	NATIONAL DATA CORP	4- 7	5 1/2	0	0.0
A	ON LINE SYSTEMS INC	17- 23	18 5/8	-1 1/4	-5.6
N	PLANNING RESEARCH	3- 5	3 3/4	0	0.0
O	PROGRAMMING & SYS	1- 1	5/8	0	0.0
O	RAPIDATA INC	2- 5	1 3/4	- 1/8	-6.6
O	REYNOLDS & REYNOLDS	13- 21	17	- 1/4	-1.4
O	SCIENTIFIC COMPUTERS	1- 2	2	0	0.0
O	TYMSHARE INC	14- 28	18	+ 3/4	+4.3
A	URS SYSTEMS	3- 5	4 1/4	+ 1/4	+6.2
N	WYLY CORP	1- 7	1 1/2	- 1/8	-7.6

PERIPHERALS & SUBSYSTEMS

EXCH		1976-77 RANGE (1)	CLOSE MAR 23 1977	WEEK NET CHNGE	WEEK PCT CHNGE
N	ADDRESSOGRAPH-MULT	8- 14	11 3/4	- 3/4	-6.0
O	ADVANCED MEMORY SYS	4- 10	7 1/4	- 1/8	-1.6
N	AMPEX CORP	5- 10	8 1/4	- 1/2	-5.7
O	ANDERSON JACOBSON	2- 4	4	+ 1/8	+3.2
N	APPLIED DIG DATA SYS	10- 25	11 3/4	- 3/8	-3.0
O	BEEHIVE MEDICAL ELEC	3- 12	10 3/4	+ 1/4	+2.3
A	BOLT,BERANEK & NEW	7- 11	7 1/4	0	0.0
N	BUNKER-RAMO	5- 12	11 1/4	- 1/8	-1.0
A	CALCOMP	3- 7	3 1/8	- 1/8	-3.8
O	CAMBRIDGE MEMORIES	0- 6	1 1/4	- 1/8	-13.0
N	CENTRONICS DATA COMP	20- 56	24 1/4	+ 1/4	+1.0
O	CODEX CORP	22- 47	45 1/2	- 3/4	-1.6
O	COGNITRONICS	1- 1	1	0	0.0
O	COMPUTER COMMUN.	1- 6	6 1/8	+ 5/8	+11.3
O	COMPUTER CONSOLES	4- 7	4 1/4	+ 1/4	+6.2
A	COMPUTER EQUIPMENT	1- 3	2 1/4	0	0.0
O	COMPUTER TRANSCEIVER	1- 3	1 3/8	+ 1/8	+10.0
O	COMTEN	4- 13	11 3/4	- 1/2	-4.0
N	CONRAC CORP	20- 27	24 7/8	0	0.0
O	DATA ACCESS SYSTEMS	1- 5	5 1/2	0	0.0
O	DATA 100	6- 13	7 5/8	- 1/4	-3.1
A	DATA PRODUCTS CORP	5- 15	10 3/4	- 5/8	-5.4
O	DATA TECHNOLOGY	1- 3	2 3/4	- 1/8	-4.5
O	DATUM INC	1- 2	1 1/2	0	0.0
O	DECISION DATA COMPUT	1- 4	2	0	0.0
O	DELTA DATA SYSTEMS	1- 1	1/2	0	0.0
N	ELECTRONIC M & M	1- 5	4 3/4	+ 1/2	+11.7
O	FABRI-TEK	1- 2	1 3/8	-	-4.3
O	GENERAL COMPUTER SYS	0- 2	5/8	0	0.0
N	HAZELTINE CORP	4- 12	10 3/8	- 1/4	-2.3
N	HARRIS CORP	27- 35	34 1/2	+ 3/8	+1.0
A	INCOTERM CORP	9- 20	13 5/8	- 1/8	-0.9
O	INFOREX INC	5- 7	5 3/8	- 1/4	-4.4
O	INFORMATION INTL INC	10- 18	12 1/4	+ 3/8	+5.1
O	INTEL CORP	47-109	50	-1	-1.9
A	LUNDY ELECTRONICS	3- 7	3 3/4	+ 5/8	+11.1
O	MSI DATA CORP	3- 8	7 1/2	0	0.0
N	MILGO ELECTRONICS	15- 37	57 1/8	0	0.0
N	MOHAWK DATA SCI	3- 10	5 3/4	- 1/4	-4.1
O	PENRIL CORP	1- 3	3 7/8	+ 1/8	+3.3
A	PERTEC CORP	3- 9	7 1/8	0	0.0
A	POTTER INSTRUMENT	2- 2	1 3/4	0	0.0
O	PRECISION INST.	2- 10	2	0	0.0
O	QUANTOR CORP	4- 6	4 1/2	- 1/4	-5.2
O	RECOGNITION EQUIP	6- 11	8	- 1/8	-1.5
O	SCAN DATA	1- 4	1 5/8	0	0.0
O	STORAGE TECHNOLOGY	9- 15	11 1/8	+ 5/8	+5.4
O	T BAR INC	5- 10	8 7/8	- 5/8	-6.5
O	TALLY CORP.	4- 6	5 1/4	0	0.0
O	TEC INC	3- 9	7 1/2	- 1/4	-3.2
N	TEKTRONIX INC	45- 69	59 3/4	0	0.0
N	TELEX	2- 5	2 5/8	0	0.0
O	WILTEK INC	1- 2	1/4	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1976-77 RANGE (1)	CLOSE MAR 23 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	BALTIMORE BUS FORMS	5- 5	2 5/8	- 1/8	-4.5
A	BARRY WRIGHT	6- 13	12	+ 1/2	+4.3
O	CYBERMATICS INC	0- 1	1/2	0	0.0
O	DUPLEX PRODUCTS INC	15- 24	17	- 3/8	-2.1
N	ENNIS BUS. FORMS	6- 8	6 5/8	+ 3/8	+6.2
O	GRAHAM MAGNETICS	8- 14	13	+ 1/2	+4.0
O	GRAPHIC CONTROLS	13- 19	14 3/4	0	0.0
N	3M COMPANY	49- 66	51 7/8	-2	-3.7
O	MOORE CORP LTD	31- 51	53	+ 3/4	+2.3
N	NASHUA CORP	11- 20	16 3/4	-1 1/4	-6.9
O	STANDARD REGISTER	15- 21	20 3/4	+ 1/2	+2.4
O	TAB PRODUCTS CO	5- 17	16 1/2	- 1/4	-1.4
N	UARCO	19- 25	20 1/4	- 1/2	-2.4
A	WABASH MAGNETICS	4- 14	13 1/8	+1 3/8	+11.7
N	WALLACE BUS FORMS	19- 25	18 1/2	-1 1/4	-6.3

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